The Builder.

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Technical School and College Building.

THE large and practical volume brought out under this title* by an architect who has made a special study of the subject, may be said to be a book for the times; for though the recently proposed Technical Education Bill failed to pass, owing in great measure to its own inherently unsatisfactory character, there is no doubt that technical education is fairly in the air at last in this country, and that the provision of buildings for the efficient and convenient administration of this class of instruction is one of the special services which will be increasingly demanded from English architects for the next quarter of a century, and for which they will require to qualify themselves. Mr. Robins, the author of the present volume, and Mr. Waterhouse, the architect of more than one large and in the main successful technical school, have secured the honour of leading the way.

Mr. Robins logically concludes that before considering what is required in schools for technical education, it is well to come to some conclusion as to what technical education consists in and what is its main object. In regard to this there have been many different opinions, but the reasonable view, and the one which is likely to be adopted by the majority of those who give any thought to the subject, is that expressed by Professor Huxley, Professor Ayrton, and the late Professor Fleeming Jenkin, from each of whom are quoted (p. 13) expressions which practically all concur in the same opinion, viz., that the object of technical education is not to teach trades (which Professor Jenkin characterised as "a mischievous delusion"), but to give a training in the principles of applied science generally, with some more special instruction in that branch of science which bears more immediately on the trade which the student intends to follow; but not professing to teach him any of the special manipulation of his trade: that he must learn elsewhere.

It is obvious that an institution on a large scale, to give general instruction on applied science, would be one of a very extensive and complicated nature, including the provision of a great variety of what may be termed "scientific plant." Indeed, the programme of a German "*Realschule* of the first grade," for students between the ages of ten and nineteen, is a little bewildering to the mind. It includes German, French, and English; a little Latin, and "plenty of mathematics"; a fair knowledge of natural history, chemistry, physics, &c.; and the list ends up with "history, geography, singing, gymnastics, drawing, machine-drawing, and religion."* We do not find among the diagrams of apparatus given in Mr. Robins's book any plans or sections of the desks and apparatus for teaching religion, though we have no doubt the systematic German mind will have developed something of the kind. Apart, however, from the "religion," this curriculum, with its languages, history, and geography, is, of course, beyond the scope of a technical school, properly so called. And it is one of the points in which the book seems a little defective, that we do not find anywhere a distinct summary of what the author considers should be included in a Technical College, and of the accommodation required in such a building, and the best manner of arranging and planning the various departments, in themselves and in relation to one another. The reader can gather a great deal about the requirements from a comparison of the plans and descriptions of various existing buildings; but we have not found any definite description of the requirements for a model technical college; and the buildings illustrated to which the term "college" would properly apply, as establishments including the whole curriculum of a technical or scientific education, are not numerous. The majority of them are schools for special training in one or two branches of technical study; and in regard to these we observe that chemical schools and laboratories occupy by far the largest place: in fact, the great majority of the illustrations of *matériel* refer entirely to chemistry. One reason, of course, for this is that rooms and plant for chemical classes present special difficulties in planning and arrangement, owing to the necessity for a complicated service of taps, pipes, and sinks, and still more for a special and thorough system of exhaust ventilation to draw off foul gases; and no doubt the many ingenious contrivances which have been adopted to serve this latter end, as well as to form a perfectly convenient arrangement of tables, shelves, and seats, are of special interest, and represent that portion of the furniture of a science school which most emphatically calls for special knowledge and study on the part of the architect. Nevertheless, there seems rather too much space bestowed on this branch of the subject in comparison with others which are hardly illustrated at all.

The programme of the *Polytechnikum* of Zurich (quoted page 18), comes nearest perhaps to the proper programme of a technical school. This Mr. Robins gives as including "Physics, chemistry, machine, engineering,* architecture, drawing, modelling, agriculture, forestry, botany, &c." What remains to be added under the head of "&c.," of course, we cannot say; probably only unimportant matters. Architecture appears to us to be out of the proper scope of a technical college, which might as well in that case include ornamental design and other artistic subjects; but it is possible that "architecture" really means here "building construction." Our idea of the programme of a technical college would be to include physics, chemistry, and mechanics; physiology, botany, and mineralogy; mathematics, geometry, and drawing: the latter not in the artistic sense, but as the cultivation of the power of delineating on paper whatever it is desired to illustrate. The three first heads include the study of the forces of nature; the three next that of the facts in regard to the three great divisions of animal, vegetable, and mineral life (so to speak); the three last deal with the power of measuring and comparing imaginary and visible quantities or forces, and of delineation in intelligible form. Such subjects as engineering, architecture, agriculture, forestry, &c., appear to us to be beyond the proper scope of a technical college; they are the practical applications of theoretic knowledge to special ends; they are, in fact, "trades," and it is not the business of a technical college to teach trades. A man who intends to be an architect, an engineer, or a cultivator of land, should go to an architect's or engineer's office,† or to an agricultural school, from the technical college, bringing his general theoretical knowledge acquired at the college to bear on the special problems of his intended profession.

No college exactly on such a plan is figured among Mr. Robins's illustrations; but the mass of information, and the number of plans of various buildings which are given, will be of great use to any one in putting together a complete scheme, and as affording suggestions and memoranda as to what is needed in each department. We only complain that there is a want of systematic exposition. On p. 45, in the

* Technical School and College Building: being a Treatise on the Design and Construction of Applied Science and Art Buildings, and their suitable Fittings and Sanitation; with a chapter on Technical Education. By Edward Cookworthy Robins, F.S.A., F.R.I.B.A., &c. London: Whittaker & Co. 1887.

* We heard a story of a well-known painter, who was educated abroad, lamenting that he had received a check early in life, from having "failed in chemistry and religion." It appears this may have been uttered in sober seriousness.

* So in text; probably the comma is a misprint, and it should read "machine-engineering," *i.e.*, mechanical engineering.

† Speaking of course in reference to England, where there are no architectural and engineering colleges, except those for preparation for the Royal Engineers and for the Indian Public Works Department.

chapter on "Buildings for Applied Science and Art Instruction," we read:—"To proceed to details. It is desirable, in the first place, to note the particular accommodation required for some of the leading special subjects, number and relative portion of apartments; in short, the systematic general arrangement of the plan." This is just what we want, but we do not get it. We only get details about the arrangement of the chemical department, and then we go off to plans and descriptions of various foreign buildings. A great deal, as we have said, may be extracted from these; but to present a number of different examples for inspection, and merely let us pick what we can out of them, is hardly a complete manner of treating the subject.

In a general way, the English plans given in the book are much less formal and probably more utilitarian in arrangement than the foreign ones. They are mostly, it must be admitted, not such large buildings; but the French and Germans are, as might be expected, very much possessed with the idea of architectural symmetry in laying out buildings of this kind; the architectural arrangement seems to come first, as far as the main massing of the plan is concerned, and the groups of rooms are then fitted into it. This, it is needless to observe, is not the most practical or philosophical manner of going to work; and it is not surprising that we are conscious of waste spaces and passages that either "lead to nothing," or take an unconscionably roundabout course in leading to something, in some of these Continental plans. The desideratum is, to have sufficient space for light and ventilation, without unduly long passages of communication, and especially to have those apartments which have to be used in conjunction with one another near together. Thus, in the case of one chemical laboratory, it is mentioned that the balance-room was at such a distance from the laboratory that the journey to it was always deferred as long as possible; which, we presume, implies that guess work was used in some stages of an analysis where accurate weighing would have been desirable.

There is a separate chapter on "Fittings for Applied Science Buildings," but this again is mainly occupied with chemical laboratory fittings. No doubt, for reasons above mentioned, these are the most difficult to deal with, and a great many sections are shown of various ingenious arrangements for carrying off noxious gases at once from the work-table, for the study of which we must refer the reader to the illustrations in Mr. Robins's pages. Two of the most efficient seem to be that at Finsbury, designed by Dr. Armstrong and shown on plate 50, where there is a down-draught escape running, with a narrow opening, along the whole length of the draught closet, and the one in use at the South Kensington building, which is essentially the same form of outlet contrived so as to serve two sets of workers, the down-draught flue, with its two sides, forming a kind of partition down the centre of the table, each side forming practically a separate table. In nearly all cases a collecting hood is placed over the table, so as to catch the vapours and convey them to the extract flue. A very ingenious modification of the draught-closet is that invented by Professor Hofman, and shown in plate 47. When draught-closet flues pass directly upwards (which is sometimes, it may be presumed, a more convenient arrangement when an extracting system of ventilation is employed), it is found that condensed liquid and dirt are very liable to drop into the closet and vitiate experiments there being performed. The Hofman method takes the flue up with a bend towards the back of the closet at first, then under the vertical portion is formed a receptacle for receiving anything that may fall from the flue. In most of the recently-constructed large public laboratories, we are told, the flues from the various closets are all connected with the central flue, and the draught is produced either by a shaft with a furnace in it or by a fan, anent which Mr. Robins observes that no competing draughts should be introduced into a chemical laboratory; "no two opposite ways should be provided for the escape of the air; and, as the draught-closets cannot well be too efficient, the whole of the air of the laboratory may be exhausted through them, but it is better to have additional outlets." This seems rather a contradiction. The author mentions elsewhere that in certain cases extract-ventilation through the draught-closets has answered completely. As he says, and as every one knows, it is no use trying to extract forcibly through two separate systems of outlets, for that is merely making one a passage to the other, and in that case what do we want with additional outlets?

In regard to ventilation, the author is entirely for mechanical ventilation, as every scientific architect must inevitably be now, after all the evidence that has been before us as to the relative efficiency of mechanical and what is rather absurdly termed natural ventilation. He seems to be against injection of air, though he quotes the testimony of Professor Carnelly, of University College, Dublin, to the effect that the system of forcing in air by air-pumps, over heated pipes, and allowing it to escape by the draught closets, instead of extracting from them by aspiration, had answered very well there. We should be disposed to prefer the extraction system,—in the case, at all events, of a chemical laboratory, where it is so requisite to remove gases instantly and by the most direct path. A hood opening into an extract flue would be more certain and immediate in its action of extracting gases formed in its neighbourhood, than a system in which general pressure of the air in the room was the agent. The gas formed by a special experiment might even, in that case, be dispersed to some extent before being forced up the nearest extraction-flue. From the chapter on "Heating and Ventilation," in which a great deal of information, not new mostly, is very conveniently summarised, it appears that the propulsion system at Finsbury Technical College has developed various defects,—dust comes from the flues, which are pargeted, and the heating and ventilation are so closely connected that quicker ventilation cannot be had without additional heat: a point to make a memorandum of in regard to the working of combined warming and ventilation. At the City and Guilds Institute, the evil of dust has been obviated by using flues lined with a glazed surface. It is noted that at this institution the internal iron smoke-flue has been removed from the main ventilating shaft, "the experience gained at Finsbury College proving its comparative inefficiency, and an extract fan has been fixed at the top of the shaft, worked by gearing from the engine in the basement": another point to be noted by those who trust to a smoke-flue up the ventilating-shaft as an aspirator. As we have said, a great deal of information is collected in this chapter, and the wholesome example is quoted of Herr Baeckelmans, architect, of Antwerp, who refused to carry out the erection of the town hospital, because the Hospital Committee would not appoint an engineer to consider the plans with him, with regard to the heating and ventilation, before the foundations were laid. Honour to Herr Baeckelmans, and may we all be more like him! Among the various methods of ventilation noted and illustrated with varying favour by the author, is one which we venture to think is quite over-rated. This is the plan, described on page 167, of admitting fresh cold air through perforations in the bed-mould of the cornice of the room, and extracting through perforations in the upper member of the same, into an upcast flue with a cowl or a gas jet at the bottom, or into a smoke flue. This is recommended by Mr. Robson, who says:—"I can speak strongly in its favour for facility of application, sightliness, economy of first cost, and self-acting properties." If the "pull" is a pretty strong one, we should imagine it would be very "self-acting," and that if those who recommend it will go up a ladder and smoke a cigar close to the inlet perforations, they will see the smoke taking the "girt" of the cornice and going the shortest way into the extract perforations. If it does not, it will be because the pull is a very weak one, and in that case it is inefficient in another manner.

Among the special difficulties which have to be encountered in the design of a technical school, the most prominent, next to that of carrying off the fumes from the chemical laboratory, is the problem of providing, also in the chemical department, a perfectly steady table for the delicate tests carried on in the balance-room. We should hardly have thought the difficulty need be greater than that of mounting an equatorial telescope, though the author speaks as if it were. In one of the foreign laboratories he found the balance-room so planned as to be a passage from one room to another,—certainly a very stupid oversight. He mentions that in one case a satisfactory table had been formed by supporting it on beams under and disconnected from the actual floor. If this was successful, *à fortiori* a concrete table, built up from the foundations, and with the floor framed round it so as not to touch it, ought to answer. Of course, in cities there is a great deal of tremor of the ground to be reckoned with; equatorial telescopes of any consequence are generally kept out of cities. Professor Ayrton has been experimenting, it appears, with schemes for supporting tables on water, with the view, we presume, of escaping earth tremors; but so far without success.

A few "pictures" of technical educational buildings by the author are added to the work, but in general the illustrations are, as is fitting, severely practical; and the large number of details of fittings, very carefully drawn in elevation and section, are of great value and interest, whether regarded as precedents and models for adoption, or as suggestions for further improvement and thinking out of the subject. For the present, and probably for some time to come, Mr. Robins's book is the authority on the subject of which it treats, and is a record of a practical experience extending over a good many years, and turned to good account, though, as we have said, there might have been more logic and system in its arrangement. The volume is appropriately dedicated to Professor Huxley.

REPORT OF THE "SELECT COMMITTEE ON ADMIRALTY AND WAR OFFICE (SITES)."

WE have already commented on the miserable and discreditable result of the deliberations of the Committee above referred to. After going through the show of a large architectural competition, in which a design, open certainly to many objections, practical and architectural, was selected, the Committee have now recommended that the scheme for a new building should be abandoned, and that a piece of cheap patchwork should be made with an old building which has nothing to recommend it, and new ones in regard to which the main object seems to be to make a bid for popularity on the ground of economy, and to cut down the whole scheme to the level of the "cheap and nasty." Even on purely architectural grounds the decision, as we have already said, is one of which the country ought to be ashamed. But the detail of the report brings it out in an even more ignominious light. The existing main building of the Admiralty is notoriously an ill-designed and clumsy affair, not worth preserving on architectural grounds, and which could only be an excrescence on any design with which it might be incorporated. For this, of course, the general public and the legislative body care nothing, national architecture being one of the things which, in the eyes of the public and of politicians, is of no consequence whatever. But we do profess to be a practical nation, and in that light, at least, it may be matter for question with most reasonable people whether a very wise or rational thing has been done in proposing to retain and utilise, as part of an important public building, a structure which is stated, on good evidence, to have an essentially defective foundation,—"the building is erected upon oak planking with sleepers laid upon it, and that oak planking lies upon a sort of mud

foundation containing water,"*—which has already settled considerably; which is given a life of about seventy-five years at the best; which would probably settle further if any additional weight were placed on it; and which cannot be made practically suitable for its proposed purpose without raising one story and adding another; in other words, putting on that additional weight which the evidence shows that it will not bear. A more lame and impotent conclusion it would be impossible to imagine, or one saying less for the good sense or good taste of those who have arrived at it from such premises.

As usual in these cases, there is a good deal that is amusing in the proceedings, or that would be amusing to any one of a cynical turn of mind. There is no sort of evidence of architectural interest in the proceedings, the object of a great portion of which seems to have been to exhibit once more the cross-examining powers of one officious and vain busybody, whose sole object is to get, if possible, his own way. That Mr. Shaw-Lefevre has not got it in this case is certainly from no want of special pleading or of industry in examining and being examined. In his proposed "report," Mr. Shaw-Lefevre takes upon himself to affirm that it is "admitted on all hands" that the internal arrangements of Messrs. Leeming's design were excellent, and that there "is ample light and air to every part of it." He must be perfectly aware that there was strong dissatisfaction in many quarters among persons who have a claim to be called experts in such matters, in regard to the provision for light and air in the smaller courts, and that they were condemned in the strongest terms by those who know more about such matters than Mr. Shaw-Lefevre ever knew or is ever likely to know. As to the design itself, it was a very commonplace one, ornate but not noble; but though we should have had no pleasure in seeing it built, we cannot but feel, after reading the evidence in the report, that the conclusion come to is likely to prove an even greater *fiasco* than the result of the competition. An architect of genius might still make something of the proposed buildings, in a simple way, and apart from the old building it is proposed to retain; but then we are only to have the same architects, cut down to plain work. Of course, if any change had been made, the Messrs. Leeming deserved, as a matter of justice, full compensation; but we do not see that, when the scheme was abandoned, they had any absolute claim to be employed on the new scheme. However, they seem very desirous to be accommodating, and to carry out the building in any way which the authorities are pleased to prescribe; and that is no doubt one of the first of virtues in an architect, according to the English official mind.

From the lengthy evidence given by Mr. Shaw-Lefevre,—which consists, in fact, to a great extent, of a sort of essay in favour of his own views,—it appears that the objection to take Drummond's and Biddulph's banks was on the ground that the two firms had been allowed to build them without any intimation that the ground might be wanted by the Government, and that therefore there would have been something unchivalrous in dispossessing them. There is something in this, no doubt; but it is hardly what ought to stand in the way of a great public work. If it is the case that Messrs. Drummond offered their land to the Government before building, and got no reply, that is one more item of the blundering which has run through the whole history. Among other points in this "evidence" the witness is good enough to assure us that the competition was "a fair representation of the architectural talent of the country," and that he can speak on that point, as he alone knows the names beyond those of the nine selected. We do not know, it is true, the names of any other competitors except those who asked us to publish their designs; but we know who were some of those who did not and would not compete; and we know that if the architectural talent of the country was fairly represented, the Committee did it great injustice, for one or two of the nine designs they selected for premiation were not only poor but absolutely vulgar. It is true we have Mr. Hardwick's evidence in admiration of the selected design; but Mr. Hardwick is the designer of Drummond's bank.

Among other points in the evidence, we observe that Mr. Shaw-Lefevre admits that in getting a vote for 10,000*l.* on account of the new building he intended to commit Parliament to that design, and to the employment of those architects. Did the members who voted know that? As Mr. Isaacs observed, it was, to say the least, "a very informal way of doing it." Among other curious points in the evidence is Mr. Taylor's theory, in regard to the lighting of the quadrangle buildings, that beyond forty-five degrees you get no more light even if the opposite buildings were removed altogether. He modified this in the next reply into the form that it is the "recognised angle for lighting a building," which is certainly a new way of putting it. It is what a man has a right to demand by law under certain circumstances, but does Mr. Taylor really believe that if a window is receiving light at an angle of 45 degrees over the top of an opposite building, that it will get no better light if that building is removed? He will not find many people who are in the habit of using their eyes to agree with him. Then Mr. Taylor, who gives evidence obviously in favour of Mr. Shaw-Lefevre's position, wants us to believe that it was quite a delusion to be shocked at the narrow, funnel-like appearance of the small courts as shown on the model (which gave many persons the first real idea of what the effect of building in this way would be); that this was the wrong way to regard it; that it would be quite different if you were down in the courts and looked up at the light. We should say that a well would look darker and deeper when you were down in it than when you were on the top; but it is not a mere question of light,—that is just the mistake; it is much more a question of ventilation, of having deep well-like receptacles in the interior of a building, which must inevitably become, in all still and warm weather, receptacles of stagnant and impure air.

Some question was raised by Mr. Isaacs in the course of the sitting as to the estimated cost of the alternative schemes, and we imagine that his questions and evidence (though very likely without his intending that result) operated a good deal with some of the committee in swaying them towards the economical conclusion ultimately adopted. Messrs. Leeming's original design was estimated at a cubical cost of 1s. a foot, and Mr. Taylor laid down that the alternative and much plainer building in which the old Admiralty was to be incorporated, would be 1s. 2d. a foot. This comparative proposition seems preposterous on the face of it; and Mr. Isaacs pointed out that the Hôtel Victoria, a building of about the same degree of decorative treatment externally as Messrs. Leeming's design, came to 1s. 6d. a cubic foot. His estimate of the possibility of executing the alternative buildings at 6½d. or 7d. a foot was an excess in the other direction, unless they were to be of prison-like plainness. But 1s. a foot would hardly do for Messrs. Leeming's design. No doubt it would be less decoratively finished internally than a modern hotel,—for the most part at least; but all the elaborate arrangements for heating, ventilation, and sanitation which would be demanded in a great set of public offices of the present day, have a great effect in sending up the price, and we should imagine 1s. 3d. per foot would be nearer than 1s. Some of the ideas afloat in the Committee about cubing are rather curious. Sir William Harcourt seems to have got hold of a notion, derived, as he said, "from Mr. Denison's 'Book on Building,' which is an authority on the subject," that a large building must necessarily be taken at a higher rate per cube foot than a smaller one. We can imagine that Sir Wm. Harcourt would be just the kind of person who would take "Denison's 'Book on Building'" to be an authority; but the idea that a building with a proportionally greater amount of empty cubic space in it as compared with cube of walling, is to cost more per cube foot, is certainly original. Mr. Taylor endeavoured to set him right by putting in the saving clause that it would depend on whether the larger building had rooms of the same size as the smaller one, *i.e.*, a proportionately large number of small rooms and cross walls; but the matter does not seem to have been made clear. Mr. Shaw-Lefevre seems to have twisted this correction of Mr. Taylor's into another absurdity in the opposite direction, for he asks the questions (2008-9), "The rooms are lower, are they not? *That would tend to add to the cost?*"!

Mr. Ewan Christian gave very decisive evidence:—

> "My view is very decidedly that the site cannot be properly completed without the purchase of the two banks and of the houses which intervene between them. I consider that the purchase and the clearing away of those buildings is essential to the great improvement that ought to be made in connexion with this great public edifice. It is a magnificent site, and it would be a very great pity to spoil it for the sake of the saving that would be effected by leaving these buildings untouched."

Mr. Christian pointed out strongly the importance of taking advantage also of the occasion to widen the upper part of Whitehall, which could otherwise probably never be done, and said the losing the chance would be "a national misfortune." Few Englishmen probably would see it in that light, because few Englishmen understand the value to a city of such an improvement in its architectural effectiveness. Mr. Christian was one of the witnesses from whom the astute cross-examiner of the Committee could not get all the replies he wanted. The following little extract is amusing; the object of the questions being, of course, to show that Mr. Shaw-Lefevre's scheme was a splendid one, without the expense of purchasing the banks and widening Whitehall:—

> "920. I presume you would be of the opinion that the façade to the Mall and to the Parade offers a very unusual opportunity for architecture?—Decidedly.
>
> 921. It is a very important site, is it not?—A most important site; that is the view I maintain.
>
> 922. Probably in London there is no more important position than would be occupied by a building with one frontage to Pall-mall and the other to the Parade?—Entirely so; *and for that reason I want to see Whitehall widened.*
>
> 923. I am merely asking you now about the Mall and the Parade; do you consider those very important frontages?—Most important frontages.
>
> 924. And that a building facing these two frontages would be a very important one in London?—I think that it would be one of the most important operations carried out during this century.
>
> 925. Do you think it unreasonable, therefore, that an important building should be placed there?—I do not think so at all; on the contrary, I want to see it very much; *but that is the reason why I want to see Whitehall widened.*"

Mr. W. H. Smith was cross-examined in the same pertinacious manner; asked, for instance, if he thought it would be a wise course to extend a building with the admitted defects of the old Admiralty building? Mr. Shaw-Lefevre knew perfectly well that no one had proposed to "extend the defects" of the building; it was proposed simply to leave it incorporated in the new building. In his answers to this and other catch questions Mr. Smith was very practical, and in his objection to the useless columns projected in front of the original design, and their effect on the lighting of the rooms. But Mr. W. H. Smith's main confession of faith is irritatingly characteristic of what we have come to in England. "It would be much more economical," he observes, "to construct a building simply for purposes of business than for architectural effect. . . . . I hope that public opinion will come round to erect what I should call a building for business purposes and not constructed for architectural effect." Public opinion, we fear, is only too ready to endorse such a sentiment, without waiting for any coming round. That is what we have come to; and a melancholy goal it is. We are a nation of shopkeepers; and the most eminent and successful shopkeeper of the day can see nothing to value in

* Mr. John Taylor's evidence.

architectural splendour,—no consideration in regard to a great national building but "how much can we save on it?"

NOTES.

THE dreadful calamity at Exeter has, of course, brought out the usual fresh crop of suggestions and advice about the construction of theatres, which are repeated after each calamity and forgotten again till the next theatre conflagration revives them. Some of these are the mere unpractical fancies of frightened persons. Among the measures which really may be carried out with great advantage, and which are within practical possibility, are the lighting of all theatres by incandescent electric lamps, the provision of an iron fireproof curtain between the stage and the house, which should be used habitually at each performance, and the employment of some less combustible material than canvas for the scenery. The use of a fine wire gauze for painting on, which has been suggested, would, we believe, be practicable and beneficial, but it would be possibly too costly to be readily adopted, except where it was desired to keep the scenery for repeated and permanent use, when the superior lasting powers of the wire might do something towards restoring the first outlay. We do not believe actors would ever be reconciled to an iron stage floor to replace the boards; and the effect upon the acoustic properties of the house would probably be bad. The daily use of the cut-off iron curtain is an important point, as the evidence in the Exeter case goes to show that the rapidity of the conflagration was mainly due to the flames being blown towards the auditorium by draughts from doors in the stage portion of the house. The suggestions for exterior balconies to which the audience could betake themselves till rescued we do not think are very rational. If they were to be made safe against a sudden crowd they would be very costly to construct, and if audiences will get into panics there would very likely be as much loss of life from a rush to the doors on to the balcony, —and perhaps even from the crowd pushing those in front of them over the parapet,—as from the rush to the ordinary exit doors. It is, after all, in most cases the unfortunate people who kill themselves, and not the fire which kills them. The evidence in regard to the Exeter disaster, so far, seems to indicate that the exit from the gallery was decidedly inadequate; but it also leads to the conclusion that no one need have been hurt if people had kept their heads. To take military order and walk downstairs in step, three abreast or two abreast, or as many as the width of the stairs allows, is the thing to do; and two or three men with cool heads might induce a crowd to do this. Unfortunately the gallery, usually the most crowded part of the house and the furthest from the street, is generally occupied by just the kind of crowd which is most liable to go into an unreasoning panic. Until people can be cured of giving way to panics they will kill themselves whenever there is an alarm of fire in a theatre, and structural improvements will be of little avail.

WE have received a circular in regard to the aims of the National Association for the Promotion of Technical Education, which was inaugurated at a meeting held in London on July 1st of this year, and of which Lord Hartington is President. Among the Vice-Presidents and members of the Executive Committee are Professor Huxley, Professor Tyndall, Sir Lyon Playfair, Sir John Lubbock, Sir F. Bramwell, Sir Henry Roscoe, and others. The subjects which it is proposed should first engage the attention of the Association are at present tabulated as follow:—

"1. The encouragement of Educational Reform, whether by legislation or otherwise, to be carried out by the following amongst other means:—(*a*) The promotion in our primary schools of the better training of the hand and eye by improved instruction in drawing, in the elements of science, and the elementary use of tools. (*b*) The introduction of such changes in the present system of primary instruction as may be necessary to enable children to take advantage of technical teaching. (*c*) The more extended provision of higher elementary schools, where technical education may be provided for those who are fit to take advantage of it. (*d*) The reform of the present system of evening schools, with special provisions for the encouragement of technical (including commercial and agricultural) instruction. (*e*) The development, organisation, and maintenance of a system of secondary education throughout the country, with a view to placing the higher technical and commercial education in our schools and colleges on a better footing. (*f*) The improvement of the training of teachers, so that they may take an effective part in the work which the Association desires to forward. 2. The formation of a central consultative body, which will give opportunities for conference between persons of various classes and from different localities, will form and influence public opinion, and will obtain public support for the furtherance of technical education. 3. The collection of information as to the existing means for carrying out the work of technical education, and the best methods of extending and organising it throughout the United Kingdom. 4. The preparation, in a popular form, of information to be obtained from Reports of Commissions, Consular Reports, and from various other sources (including, if necessary, special inquiries at home and abroad), for diffusion throughout the country."

It is proposed to form branches in various industrial towns, and a circular letter has been addressed to those known to be interested in the subject, asking them to give the names of others in their town or district who would be able to give advice as to the work of the Association, and also information as to what has been actually done in the way of technical education in their own neighbourhood. This appears a business-like way of getting an enlightened public opinion on the subject, and promoting public interest in it, which is an almost necessary preliminary to getting any complete educational measure carried out.

IN the matter of absurd wrong-headedness, the Trades Union Congress appears to go from bad to worse. It now meets not to consider questions of trade, but to criticise political action from a Utopian standpoint of its own, on which the glorified working man takes his place as the centre of the universe. The usual clamour about an eight hours' movement was brought forward, on the principle apparently that the less work we do the more prosperous we shall be, and Mr. Broadhurst was taken to task for having presumed to vote against an eight-hours amendment in the Coal Mines Bill. Mr. Broadhurst, however, is not the member to put up with this kind of thing, or to allow himself to be dragged at the heels of a committee, and he gave the principal accuser, a certain Mr. Hardie, "frae the North," an answer which must have made him feel rather small.

A NEW use has been discovered for the water of the river Thames as it is found near Blackwall. It makes an efficient ink. Whether the fluid is agreeable, or even inoffensive, in the inkstand is not stated. But letters have been written to the daily papers in this medium, and as they have appeared in print the ink has, at all events, remained legible when dry. The attention of the Home Secretary was called to this phenomenon in the House of Commons, on September 1st, and Mr. Matthews expressed the hope that "when the new works now in progress are completed the cause of complaint will be lessened, if not removed." It would be consolatory to have the scientific ground for the hope stated. It seems not to have occurred to any one to ask for an explanation of the colour. The Metropolitan Board ought not to be surprised at its appearance. It is only the recurrence of what has taken place at Bradford, Northampton, Leicester, Clifton, Cheltenham,—in fact, everywhere where a mixture of lime with any iron salt has been applied to sewage. This fact has been brought before the Institution of Civil Engineers ("Minutes of Proceedings," vol. 85, p. 223); nor is the colour the worst part of the affair. The first action of the compound is apparently satisfactory, and clarification goes on rapidly. But after a sufficient lapse of time in the laboratory, or after a flow of four or five miles down the river, a secondary action commences, and the liberation of hydrogen gas causes an intolerable nuisance. At Northampton 62·30 grains out of 119·78 grains of foreign matter per gallon were precipitated by chloride of iron and lime, which removed almost the whole of the suspended matter in the sewage, while increasing that in solution. But the secondary action was so offensive that the Court of Chancery granted an injunction against the process, which was in consequence abandoned, as was the case in the other places mentioned. The treatment of the whole volume of London sewage by the same process may thus be not unreasonably expected to intensify the nuisance, which has thus far justified the warning given at the Institution of Civil Engineers.

THE subject of the Channel Tunnel has come up at the British Association in the shape of a report, drawn up by Mr. F. Brady, Mr. Pigou, and Professor Boyd Dawkins. The report is entirely in favour of the tunnel, so far as the behaviour of the ground, as far as the boring has been carried, is concerned. The authors of the report are contemptuous about the military objections, their report being obviously made in what are supposed to be commercial interests. But they do not touch on the subject of the means of properly ventilating a tunnel twenty-five miles long, with no possibility of intermediate upcast shafts. This, independently of the military objections, is one of the points which must be satisfactorily settled before things are allowed to go further.

THE Law and City Courts Committee recommend the Corporation to take no further steps at present to acquire the site of No. 84, Basinghall-street for the new Court, since they have failed to make satisfactory terms with the leaseholders and tenants. On the other hand, they advocate the adoption of some plans and elevations, in the Gothic style, as an alternative for some others in the Italian style, all prepared by Mr. A. Murray, acting architect. Mr. Murray's plans cover the present Court site, together with the Guildhall stores and land tax rooms, and are capable of extension so as to take in the now site of No. 84, Basinghall-street, if it be eventually secured. The cost of the initial buildings is estimated at about 14,500*l.* to which should be added 1,500*l.* for fittings. A complete development of the scheme would involve an additional outlay of say 6,000*l.* The Committee accordingly ask for authority to draw for 16,000*l.* upon the City of London Court general fund wherewith to proceed with the erection of new Court buildings.

ADDITIONAL buildings are about to be erected by the Government at Edinburgh Castle, and, judging from past experience, we are not sanguine as to the result being a gain from an æsthetic point of view. We gather from the *Scotsman* that the Town Council, "in their capacity as Guardians of the amenity of the City, urged certain objections to the scheme." The principal part of this scheme consists in the erection of a guard-house at the entrance to the ancient fortress, and certain adjuncts. "It was thought that the guard-room might have been more artistically designed, and fears were expressed that the screen wall would interfere with the view of the Castle Rock. It is not clear whether these objections took written shape, but recently, when the subject was revived, the Council were informed that the day of grace for lodging objections had passed, and that the scheme must be proceeded with as designed by the English officials." The guard-house is to be in a "castellated" style of architecture, with loopholes, battlemented parapet, guroyles, and turrets, rising to a height of 50 ft., pierced by a circular archway. The upper floor is to be utilised as a court-martial room. Contracts for the building have been entered into, which will now be pushed on with all convenient speed.

NOTHING shows the unquenchable vitality of the United States so much as its railway mileage account for 1886 and part of this year. Notwithstanding strikes, droughts, and depression of trade, the enormous quantity of 10,000 miles is expected to be the sum

of this year's laying, more than ever has been known before except in 1882, when 11,568 miles were put down. This brings up the total of the American railway mileage to 141,300 miles, half of which has made its appearance altogether since 1874, 70,000 miles in thirteen years. As might be expected, some parts of the country are specially active in railway making, the Eastern or older States contributing little or nothing to the general stock, while the South (Texas particularly) and the North-West have been the busiest, showing the growth of population and industrial undertakings. The fact is that the Southern States, though pretty old in years, have practically only just begun their real commercial life (always excepting cotton), and so far are only on a par with younger States in the North-West, like Kansas and Dakota. Even at the very moderate estimate of 25,000 dols. per mile, including stations, put down for the construction of North American railways, the 93,750,000 dols. is a pretty large sum to disburse for carriage purposes.

AN interesting bas-relief relating to the myth of Pentheus has just been published in the "Bullettino della Commissione Archeologica Communale di Roma" (xv., 7). It was found during the excavations carried on by Sir Savile Lumley, the English Ambassador, in the Via Portuense. The figure of Pentheus occupies the centre of the design; in his right hand he holds a sword which he has just drawn from the scabbard he holds in his left. On either side of him is a Mænad brandishing a thyrsos and with a snake coiled about her left arm. The type of the design is much the same as that currently employed to represent Orestes pursued by the Furies, but from the fact that the two women hold thyrsi in their hands there can be no doubt of their Bacchic intent, and hence the youth they pursue must be Pentheus. The relief is executed in the pseudo-archaic style, and Sig. Borsari, who edits it, thinks that from the character of the tomb in which it was found it belongs to the first century A.D. Figured monuments of the myth of Pentheus are notably rare.

SINCE the discovery of the Pergamene frieze with the Gigantomachia, special interest has naturally attached to everything dealing with the mythology of the Giants. It might almost certainly have been predicted that Germany would shortly furnish us with an exhaustive treatise on the myth as it appears in literature and art. Such a treatise is in fact "Die Giganten und Titanen in der Antiken Sage und Kunst," just published by Dr. Maximilian Mayer,—a book which will be read by only a few, but referred to by many. Herr Mayer devotes the first part of his book to the literature of the subject. He gives all the variant saga of the Giants and Titans collectively, and of the several individual Giants and Titans whose names have come down to us. Next, he gives in chronological sequence the various forms of the Gigantomachia. Under the head of Art, he goes through, first, the description of works of art that have perished; then representations on vases, sculptures, and smaller monuments, such as terra-cotta gems and coins. The book is illustrated by three plates and a few woodcuts.

THE house, No. 42, Lothian-street, Edinburgh, which was formerly occupied by Thomas de Quincey, and where he died in 1859, has been distinguished by a tablet, composed of tiles with an ornamental border, the letters being in ivory white on an Indian red ground. The inscription is as follows:—

THOMAS DE QUINCEY,
PROSE WRITER,
Born 1785—Died 1859,
LIVED HERE.

Something of a similar description is to be done upon a new building in course of erection in Chambers-street, upon the site of the house where Sir Walter Scott was born. The house where he resided in Castle-street might also be distinguished, and there are many others throughout the city which were occupied by men of note where tablets might be inserted. The pillar which is to receive the statue of the Duke of Buccleuch, by Mr. Boehm, has been complete for several weeks; the statue and other sculptures are on the ground ready to be fitted up, but nothing is being done. A high canvas screen hides all within from view, and we are given to understand that things will remain *in statu quo* till the 6th of next month, when there will be a ceremonial inauguration and banquet.

BY the removal of some old houses at the south-west corner of Little Queen-street, Holborn, there is now afforded an excellent opportunity of making a great and long-needed improvement. The point in question is at the junction of Little Queen-street with Great Queen-street, and everybody who knows these streets is aware of the large amount of vehicular traffic which they take, and is acquainted with the great frequency of accidents and blocks, caused by the narrowness of Little Queen-street and the abruptness of the turn into Great Queen-street. We would commend to the notice of the Holborn District Board of Works, and others whom it may concern, the desirability of utilising part of the now vacant site by rounding-off the angle so as the better to accommodate the ever-increasing traffic. That the traffic is increasing is shown by the fact that these two streets now form part of the route of two lines of omnibuses, running between the King's Cross and Victoria termini. Great Queen-street and Little Queen-street certainly form an important link between main arteries for through traffic, and the improvement which is now possible may therefore, we think, be fairly regarded as "metropolitan" rather than "local" in character,—a distinction which, if recognised at Spring-gardens, would permit of half of the cost (which cannot be very considerable) being defrayed by the Metropolitan Board of Works.

FROM a report published in the *Nouvelles Annales de la Construction*, the total area of the streets of Paris, measured between the kerbs, amounted at the end of 1886 to 8,517,100 square mètres (91,678,065 square feet), of which 6,252,000 square mètres are laid in granite, 1,608,100 square mètres macadamised, 302,000 square mètres asphalted, and 355,000 square mètres provided with wood pavement. The cost last year for relaying and repairs amounted to 11,000,000 fr. (440,000*l.*). To put all the streets of Paris into thorough order would require about 75,000,000 fr. (3,000,000*l.*), of which 15 millions would have to be spent in changing macadamised roads into pavement, and 60 millions in improving existing pavements. It has not yet been determined in what way the latter is to be effected. The bed of concrete under a pavement of stone cubes, which has been tried in the Rue St. Lazare, has not answered. The noise caused by the passing traffic has been increased, whilst the vibration is felt more than ever in the houses. It has been found, moreover, that the Yvette sandstone employed, notwithstanding its great hardness, is being crushed between the bed of concrete and the wheels of vehicles as between an anvil and a hammer. The experimental pavement laid down in the Rue de Rivoli, in which a layer of sand has been introduced between the bed of concrete and the stone cubes, in order to ensure a certain amount of elasticity, has proved more successful. Wood pavements appear to give every satisfaction at Paris, and they are now also to be introduced in the tracks of tramways.

THE surplus fund derived from the International Exhibition of last year at Edinburgh has not yet been disposed of. To aid in the building of a mechanical laboratory in connexion with the chair of Engineering in the University, for which a sum of 10,000*l.* is needed, Professor Armstrong has advanced a claim upon that fund. "No provision," says the Professor, "has been made for supplying the department with anything in the shape of a proper equipment for teaching appliances viewed from the modern standpoint,"—a state of things which he trusts will be remedied.

IN the series of "Œffentliche Vorträge," published annually at Basle, and which for the most part treat of scientific subjects, Dr. Hugo Blumner, a Zurich professor, has a paper worth reading on the "Life and Education of a Greek Artist" (Lebens und Bildungsgang eines griechischen Künstlers). As he rightly says, to write the history of any individual artist would be impossible; we have no Vasari for Greek artists; but to put together a sort of mosaic of scattered notices, and thereby construct for artist life as a whole a sort of conjectural biography, is a possible and by no means an unprofitable task. He has brought together a number of interesting details as to the status of the artist, his relation to his model, the relation of master and pupil, students' fees, the price of works of art, and the like. It will surprise many to learn that enthusiasts about art as the Greeks were, they nevertheless looked down with a frank contempt on the artist as a handicraftsman. This rule of general etiquette was, it is true, honoured in the breach: Pheidias was the friend of Pericles, and Lysippus the companion of Alexander: but an artist had to rise to pre-eminence before he rid himself of the social slur. The *locus classicus* on this point is, of course, Lucian's account of his own brief apprenticeship to art in the sculptor's studio. Lucian, the most susceptible of art critics, puts into the mouth of his dream-lady, Eloquence (a special pleader, it is true), this description of a statuary's life:—"By turning statuary you will become nothing but a low mechanic, living on the work of your hands, and confining all your hopes and desires to that alone; getting a mean and scanty subsistence in obscurity, poor and dejected, neither serviceable to your friends nor formidable to your enemies, neither courted nor envied by your fellow citizens: a low plebeian always, like the timid hare, in dread of your superiors, and looking up with adoration to the great and eloquent above you. Should you even become a Pheidias or Polycletos, all men will admire your skill, but not one, whilst they are in their senses, will wish to change conditions with you; for, after all, you will be considered as a vulgar mechanic (χειρώναξ), who lives by the labour of his hands." Certainly the modern cult of the craftsman was not in vogue at Athens.

A CORRESPONDENT, writing in reference to our foot-note to the article on "Recent Excavations at the Acropolis" (page 319, *ante*), observes that στεφανη is not correctly translated a "wreath." It is not; a "circlet" would be the more correct expression. But when our correspondent goes on to defend the use of "stephane" as an English word, we are quite impenitent. There is an absurd tendency in the present day to invent new systems of nomenclature in art and archæology (not to speak of such varieties as Alpine club slang, with its "arêtes" and "schrunds," &c.): South Kensington has a jargon of its own; Greek archæologists threaten us with another. There are English words enough to describe most objects in art, without using bastard Anglo-Greek.

JUDGING from the report in *L'Emulation*, an architectural contemporary hailing from Brussels, of an excursion by a party of Belgian architects to Maestricht, Aix-la-Chapelle, and Cologne, recently, the architectural confraternity in that part of the world seem to have a gay and light-hearted manner of enjoying themselves and entertaining their *confrères*. At a dinner given to the visitors at the "Dragon d'Or," at Cologne, the usual toasts and speeches were varied by the singing of songs composed for the occasion. The chorus of one of them is sufficiently to the point for quotation:—

"Ob gothisch ob roman,
Man fängt's mit trinken an,
Ob Renaissance und Zopf,
Es trinkt ein jeder Tropf,
Rococco, Néogrec,
Das hat ein Jeder weg,
Im Flâm'schen Styl, Pariser Styl, im Mischmaschstyl, mit Schnickschnack viel,—
Bei allem Bruen, das ich nannte,
Da trinkt man stets das anerkannte
Das elegante und pikante,—
Hoooch
La Société Centrale d'Architecture—Hurrah!"

ENGLISH ARCHÆOLOGISTS IN BRITTANY.

On the evening of Thursday, the 11th of August, the day but one following the close of the Salisbury meeting of the Royal Archæological Institute, a party of the members, joined by several members of the Wiltshire Archæological Society, started from Southampton for Cherbourg to fulfil an invitation given in the spring of this year to the members of the Institute by the Société Polymathique du Morbihan, asking them to visit their district in the south of Brittany, which is one of the richest in the world in prehistoric remains. We are indebted to a member of the party for the following account of the visit:—

The travellers arrived at Cherbourg early on Friday morning, the 12th inst., after a fine passage, and by midday reached Coutances, their first stopping-place, where they visited the cathedral, the churches of St. Nicholas and St. Pierre, and the public gardens. The present cathedral is stated to have been commenced in 1206, on the site of an earlier eleventh-century church, of which no remains are now visible. Whether this date be correct or not, the church is undoubtedly of early thirteenth-century date, and very nearly coeval with Salisbury Cathedral, which the visitors had seen only a few days previously. It contrasts with Salisbury by having a lofty lantern tower as an integral part of the design of the original builders; and the two churches show how the architects of France and England worked side by side, each carrying out the same principles. The cathedral was readily thrown open to the party, who, by the kindness of the authorities and of the Mayor of the town, had an ample opportunity of inspecting every part of it. The glorious lantern is too well known to require more than passing mention; but the exquisite foliage carving to be found in many parts of the church, but especially in the two lateral porches so singularly placed at the extreme west end of the nave, received, as it deserved, attentive study. It has up to the present happily escaped restoration, and should on no account be missed by any architectural visitor to Coutances. The demon of restoration, doing his destructive work all over France, is happily absent from Coutances just now. Some repairs are being done, chiefly to the north windows of the nave and to the lantern. A beautiful chapel on the south side of the choir is in a sadly neglected condition, but probably requires little more than cleaning and the removal of a mass of incongruous furniture. The other two churches of Coutances are often overlooked, but are both interesting. St. Nicholas, a large cruciform church, has choir and crossing of apparently late thirteenth-century work, with later nave, while St. Pierre, a Flamboyant church, also cruciform in plan, is surmounted by an octagonal lantern, Renaissance in style, the design evidently inspired by that of the cathedral, and showing how the architects of the sixteenth century could apply in their own style a design used in the cathedral by those of the thirteenth. In domestic work the city cannot be called rich, but there are very many old houses to be found which have so far escaped the hand of the restorer.

One of the great beauties of Coutances is its public garden bequeathed to the town, together with his house now used as a museum by a private citizen. After the fatigues of the day and the previous night, its quiet shade and fine view were exceedingly grateful to the English party. The visitors went on in the evening to Pont Orson, where they spent the night, visiting next day Mont St. Michel. This noble pile of buildings has now been taken over as a national monument by the French Government, who, although they allow no religious service within the walls, are busily engaged in putting the church and monastery through a process of restoration. The spirit in which this is carried out may be judged from the fact that after thoroughly scraping the First Pointed carving of the cloister, which was, perhaps, in beauty, second to no Gothic carving in the world, making all the shafts "as good as new," the ambulatory has been covered with a high-pitched roof of black glazed tiles having a broad band of brightly-glazed tiles coloured orange and blue carried horizontally half-way up the roof completely round the four sides of the square. The church is now in hand for complete restoration,—by no means the first time it has gone through the process, and it is much to be feared that in a few months hardly a stone of the fine Norman nave and transepts, which, if correctly dated 1020, are among the earliest known specimens of Norman work left us, will be seen in its original condition. The dormitory, which is placed in an unusual position on the east side of the cloister, and on the same level, is next to be taken in hand, after which the turns of the Salle des Chevaliers and the Salle des Moines will, no doubt, come. All who wish to see the Mount before this destructive process is carried out should lose no time in visiting it.

Pont Orson, where the travellers first saw Brittany, is generally overlooked by visitors to Mont St. Michel, who pass through it without stopping; but there is a good deal to be found there of interest to architect and archæologist. The church has a Norman nave, with central tower, chancel, and transepts of later date. The sculpture of the Norman south door of the nave is very remarkable. The tympanum is plain, but in the middle of it is sculptured in low relief the figure of a man standing apparently with his hands on each side of his waist, while a bird, nearly as tall as the man, standing erect, with the end of his tail in the ground, and his two feet on the man's right hip, is pecking at his neck with his beak. The members were much puzzled by these figures, and would be glad if any of our readers could give an explanation of their meaning. In the north transept chapel is a sculptured reredos of Renaissance work, representing scenes from the life of Our Lord in very high relief. It is much mutilated, and the kneeling figures of the donor and his wife in the lowest panel to the right of the spectator are almost broken away, but enough of them remains to identify their dress. Another large panel, worked probably by the same hand, is now at the side of the chapel under the window. These sculptures are stated to have been all removed from a destroyed chapel of a lapsed guild. The guild is said to have been founded in the thirteenth century. The church is almost paved with grave slabs of a very peculiar character. They are lettered with very large letters in relief, most of them having nearly the form of Lombardic lettering. These stones are mostly dated between 1600 and 1700, and go to show that the little village was a place of some importance during that century, a surmise borne out by the houses still standing. There are several good old houses left, especially an old blacksmith's forge in the main street. It may possibly be of sixteenth-century date, and is almost unaltered, with shingle roof and thick oak posts, by which generation after generation of horses have stood to be shod.

On their return from Mont St. Michel, the archæological party left for Rennes, arriving there rather late on Saturday evening. Although great part of Rennes presents no objects of interest beyond those found in ordinary French towns, and is in consequence often avoided by architectural travellers, there is in the old parts of the town, which escaped the fire of 1720, a great deal of Domestic work left, dating from the fifteenth century downwards,—much mutilated, no doubt, but happily unrestored. This is chiefly to be found in the neighbourhood of the cathedral. The Rue St. Yves is almost entirely composed of old houses, and there is one especially fine example of a late fifteenth-century house a few doors up a small street turning out of the Rue de la Monnaye. Up a court, immediately opposite the west door of the cathedral, much concealed by houses, is one of the old city gates, in very fair preservation.

The cathedral is entirely modern, having been finished as late as 1847, but it contains some good modern wall-paintings in the choir. The other churches have little calling for remark. There is a good Late Flamboyant church, now desecrated, near the Quay and the Rue St. Yves.

The Museum was visited by the travellers, the custodian having been informed of their intention by the President of the Rennes Archæological Society. It contains a fair collection of stone implements, but not much of local interest. There are some new cases filled with flint flakes, &c., from the neighbourhood of Dol, with a notice that the best specimens are withdrawn for further examination. We could not learn any particulars about these finds, but they may turn out to be of great archæological value. We understand that it is intended to publish full information shortly. A great part of the afternoon was spent in the Public Garden, one of the great beauties of Rennes, and on Monday morning the party started for Vannes by the first train.

They arrived at Vannes about midday, and were met at the station by Admiral Tremlett, an old and much-esteemed member of the Institute, under whose guidance the various places in South Brittany were visited. After seeing part of the town the party was received by the Count de Limur at his mansion, and there shown the splendid collection of minerals, brought together entirely by himself. He especially called the attention of the visitors to specimens of jadeite from a vein he discovered some years ago at Roquedas, a few miles from Vannes, and which bears a remarkable similarity to that of New Caledonia. He also pointed out some specimens of stalactites formed of oxide of iron, almost pure, from caves in Finisterre, near the Pointe du Raz.

Later in the afternoon the archæologists visited the museum of the Société Polymathique, and were there met by Dr. De Closmadeuc and other members of the society; but many others were prevented from attending by the fact that the 15th of August was the date of a religious fête, the Assumption of the Virgin, very strictly observed in Brittany. On their way to the museum the English met one of the church processions (consisting chiefly of children) which are so often seen here. Dr. De Closmadeuc, who was himself present at the finding of many of the treasures in the museum, devoted much of his time to going through it and explaining the exhibits. Here are preserved the polished stone axes, &c., found in the Mont St. Michel, Carnac, the Butte de Tumiac, and in most of the more important dolmens and excavations made in the Morbihan district; and no museum in Europe is richer than that of Vannes in its own class of neolithic implements.

On Tuesday morning, August 16th, the party started in carriages for the peninsula of Rhys, which forms the southern shore of the Morbihan Sea, shutting it out from the Bay of Biscay. This peninsula is generally low and flat, but enjoys a very mild climate. It is about the most northerly part of France in which vines are cultivated, vineyards being entirely wanting at Vannes, Auray, and the other places visited by the tourists. There are large salt-ponds on the flat shores, the manufacture of salt from sea water and the breeding of oysters being about the only local industry except agriculture. After a drive of some ten miles the carriages stopped at the Castle of Sucinio, a well-preserved ruin, built by the Dukes of Brittany originally in 1250, but almost or entirely rebuilt in 1420. The moat is very well preserved; it is now dry, but holds some water in winter and probably in ordinary summers. Of the seven towers six remain with their curtain walls very perfect and still crowned by machicolations, but the battlements are entirely lost. In plan the castle was an irregular pentagon, the east face consisting of the gate and gate towers, two angle towers, one of which contained the well, and a tower in which was the chapel, between the gate and the well tower. The window of the chapel and the springers of the vault are well preserved, and the well and well-chamber are almost perfect.

Leaving Sucinio for Sarzeau, the road runs for some distance parallel to a very high, ancient wall, apparently the boundary of a chase or park belonging to the owners of the castle. In this wall long strings of stones are occasionally found, set herring-bone wise, but this is not at all uncommon in Mediæval buildings in this neighbourhood.

At Sarzeau, where the halt for lunch was made, there is little of interest except a few old houses and farm buildings in the village, and a good Renaissance château a little way out of it. It was the birthplace of Le Sage, author of "Gil Blas," and the house in which he was born is still pointed out, but the part now visible can hardly have been built in his day.

The next place visited was St. Gildas, situated close to the open sea, on the southern side of the peninsula, and frequented in summer for sea bathing. This was the site of a very ancient monastery, said to have been founded by St. Gildas, in the sixth century, but more famous from having been once under the rule of Abelard. The transepts and eastern limb of the twelfth-century church, in the Romanesque style of the Loire and Angoulême, still remains, but the arches forming the chevet

have just been taken down and rebuilt, and the whole church is undergoing restoration. It is now used as the parish church. Some very curious capitals, supposed to be those of the nave arcades destroyed in the last century, are still in the floor,—two, one on each side of the door, being used as holy water basins.

The convent buildings are all modern, and are occupied by a few Religeuses who take in boarders during the bathing season, but these are expected to conform to rather strict rules.

From St. Gildas the party returned to Vannes by road, passing at a distance the Butte de Tumiac, one of the finest tumuli known, and one which some years ago richly rewarded the explorations of the Société Polymathique. The chamber then discovered in it is now inaccessible, being filled up with *detritus* from the mound above.

THE RELICS IN PICCADILLY.

SOME alleged sixteenth-century relics have been discovered in Piccadilly. They comprise, we read, a mass of parchment MSS., sporting guns, bronze armour, and a red granite tomb or sarcophagus. These articles were found in a series of arches at a depth of from 16 ft. to 17 ft. below the surface, in the course of excavations that are being made for the new premises of the Junior Travellers' Club, Nos. 96-7, at the south-western corner of White Horse-street, by the Badminton Club. Bearing in mind the history of this portion of the highway,—until comparatively recent times a country road,—it would seem that the things found can boast of but little antiquity. For, according to a copy plan, *penes nos*, of the Lord Berkeley's Estate, as surveyed in 1676, the modern White Horse-street stands in what was then known as the Stone Bridge Fields. These fields, being a plot of 9 acres, triangular in shape, were divided by the Aye Brooke, or Tyburn, from the Shoulder of Mutton Field (nearly 4 acres) and the Great Brooke Field (13 acres). The Tyburn here ran south-westwards, in its course from the Penneless Bank, at Hay Hill Farm, to the hollow eastwards of the Brooke Shott, where, at the ancient Cow ford, it crossed the highway to Bath, Exeter, and Western England. This hollow, latterly known as Stonebridge Close, is still plainly discernible both in Piccadilly and the Green, formerly the Upper, Park. It often lay quite under water, and at times even the bridge failed to render the road passable, as for instance, when in March, 1692, Sir Robert Atkyns, Speaker, was prevented by the flood from attending an urgent meeting of the Commons. A contemporary account of Wyatt's rebellion describes the posting of cannon upon the eminence at Brooke Shott (where the Parliament afterwards planted a fort or redoubt, in 1643), and the placing of troops of horse along "the road [Piccadilly], above the new bridge over against St. James's." "Berkely Fields," again, are set out in a plan of the Grosvenor Estate, as surveyed for building improvements, in 1723. The Brooke Shott, famous for its ice-houses and duels, was subsequently taken in for the plantation, or Wilderness, attached to the Ranger's Lodge, which R. Adam built in 1768. We find by a State Paper that in 1666-7 had been built the wall which, until about forty years ago, bounded the Green Park along its Piccadilly side. From various other maps and plans it clearly appears that until 150 years ago, at most, the northern side of Piccadilly, in this portion of the thoroughfare now so-called, was not occupied, save by some masons' yards, a few small tenements here and there, and one or two inns. Amongst these inns were the Hercules' Pillars, familiar to readers of "Tom Jones," and the Greyhound (its site bought by the Earl of Coventry in 1764, for 10,000 guineas), the Half-Moon, and the White Horse. The signs of the last two named are preserved in existing thoroughfares. The White Horse inn, its yard and paddock reaching at the back to Shepherd's, or, rather, Sheppard's Market, was standing as late as 1752, according to Mr. H. B. Wheatley's "Round About Piccadilly." But the inn is unmistakably cited in Baldwin's "New Complete Guide for 1774-5." In John Lockie's "Topography of London, 1810," White Horse-street, Piccadilly, appears. Meanwhile the building of Piccadilly, as we now know it, had gradually extended westwards. In 1710 Bolton-street was the most westernly street in this quarter of the town. Bath House at its corner (west) was built for William Pulteney (Lord Bath), but has been rebuilt by Alexander Baring, elevated Lord Ashburton, 10th April, 1835. The next turning is Clarges-street (1717-8). Just beyond, on the site of Carter's statuary works, stood Hertford House, once the Pulteney Hotel, which, having been originally built for the Earl of Barrymore by Novosielski and added to by Smirke, was re-erected, mainly with the existing stones, in 1851. The next is what is mentioned in the "New Complete Guide," *ut supra*, as Half-Moon-street, Hyde Park-road. Then comes White Horse-street. We may add that next east of Carter's statuary works, "near to the Queen's Mead House, in Hyde Park-road," was the workshop of John Van Nost, a maker of leaden figures, who came to England with King William III.

THE ANNUAL REPORT OF THE LOCAL GOVERNMENT BOARD.

THE Sixteenth Annual Report of the Local Government Board, 1886-87, just issued,* is dated "June, 1887," so that, considering its bulk (including appendices it consists of upwards of 600 pages), it has made its appearance within what,—for a Government publication,—must be regarded as a fairly reasonable interval. The Report itself, signed by the President of the Board, the Right Hon. C. T. Ritchie, occupies 172 pages, and is divided into three parts, viz.,—I., Relief of the Poor and the Poor Rate; II., Local Government and the Public Health; III., Local Taxation and Valuation. It is with the second section that we and our readers are most directly concerned, from a sanitary point of view; but it is impossible to read through the Report without seeing that all three of the subjects enumerated are more closely affected by each other than is always remembered.

With regard to Poor Law Relief, it appears that on the 1st of January last the total number of paupers of all classes in England and Wales in receipt of relief was 822,215, of whom 201,598 were indoor and 620,517 out-door paupers. As compared with the returns of the 1st of January, 1886, these figures show a net increase of 9,201, or 1·1 per cent. on the total number of paupers. On the other hand, it is satisfactory (bearing in mind the continuous increase in the amount expended on the relief of the poor during the ten preceding years) to find from the returns that the cost of the relief of the poor during the year ending Lady Day, 1886 (8,296,230*l.*) was 195,370*l.* less than in the preceding year. This expenditure represented an average charge of 6s. 0½d. per head on the estimated population, being 2½d. per head less than in the preceding year, and an average rate of 1s. 1½d. in the pound on the rateable value of the property liable to contribute to the Poor-rate. The Report chronicles a fair amount of work in the shape of the erection of new buildings for poor-law administration, and enumerates several important new works of the kind which need to be taken in hand as soon as possible. Appendix B contains the reports of the several Poor-Law Inspectors. We notice that Mr. R. Hedley, the Inspector for the district comprising the Metropolis, confirms what was our view at the time of the "Mansion House Fund." He says he believes that the Mansion House Fund, which was hastily collected and hastily distributed in the early part of the year under review, "has had its effect in increasing the number of persons chargeable to the poor-rates,"—mainly, we suppose (though we do not notice that Mr. Hedley says so), because the existence of a big fund to be doled away attracted from the country large numbers of helpless or shiftless people who would not otherwise have come to London, but who, now they are here, are some of them a burden upon the rates, while others are in the over-glutted labour market. It is not surprising, therefore, to find Mr. Hedley coming to the conclusion that a further increase of pauperism in the metropolis may be looked for, "unless in the near future we are favoured by a great increase in commercial activity." Although Mr. Hedley doubts the very exceptional character of the distress of the year 1886 in the metropolis, he says,—

"I believe that the building trade in London was during the year perhaps more depressed than any other. I have been told that there are many offices and warehouses in the City and central parts of the metropolis which are unoccupied, and I know that in some unions there are hundreds, aye thousands, of empty houses.*

The building trade of London must always be large, for purposes of renewal only, but it is difficult to wish for a revival of activity in the covering of acre upon acre and field after field of the outskirts of London with row upon row of brick dwelling-houses; and I could gladly learn that many of those who have hitherto been engaged in work of that kind had been absorbed into other branches of industry."

These words are full of suggestiveness, and, in so far as they are directed towards the stopping of "jerry" building, we quite sympathise with them, though obviously it would ill become us to deprecate the growth of the legitimate building industries of the metropolis.

Turning now to the second section of the Report, viz., that dealing with "Local Government and Public Health," we find that since the constitution of the Local Government Board on its present basis in August, 1871, it has sanctioned the borrowing, by Urban and Rural Sanitary Authorities, of amounts reaching a gross total of 36,722,067*l.* By far the greater proportion of these loans has been sanctioned for the purpose of sanitary improvements in Urban Districts, to be executed under the provisions of the Sanitary Acts, the Public Health Act, 1875, and Local Acts and Provisional Orders. The remainder has been sanctioned principally for the execution of sanitary improvements in Rural Districts, or for improvement schemes in Urban Districts under the Artisans' and Labourers' Dwellings Improvement Act, 1875. Of the amount mentioned, thirty-one millions and a quarter have been sanctioned as expenditure for sanitary purposes in urban districts, 2,378,331*l.* for similar works in rural districts, and 2,243,353*l.* for expenditure under the Artisans' and Labourers' Dwellings Act. In addition, the Board has since its constitution sanctioned loans to joint boards to the amount of 950,284*l.* These loans are in respect of systems of sewerage and sewage disposal, or for the provision of hospitals. With regard to the appointment and salaries of sanitary officers, we are glad to notice the following passages in the Report,—

"In some of the cases in which we received applications for sanctions to appointments under our Regulations, with a view to the repayment of a moiety of the salaries of the officers out of the Parliamentary Grant, the arrangements proposed did not appear to us to be satisfactory, and we deemed it necessary to withhold our assent.

We have, in previous Reports, referred to the inadequacy of the salaries frequently proposed by Sanitary Authorities, and during the past year we received numerous proposals, when an office became vacant, to reduce the salary previously assigned to it. In many cases, however, the existing salaries did not appear to us to be more than adequate to secure the efficient discharge of the duties, and we therefore felt compelled to withhold our assent. We are fully sensible of the reasons urged by many Authorities for endeavouring to reduce local expenditure, and are desirous of co-operating with them in this direction whenever such reduction may be effected without impairing the efficiency of local administration. There are, however, other considerations to which we cannot but attach great weight, especially in those cases in which a moiety of the salary of the officer is repaid out of the Parliamentary Grant, for the proper distribution of which we are responsible.

The object of the Grant is not only to relieve the local rates by means of a subvention from Imperial Revenue, but also to secure the appointment of efficient officers by aiding the local Authorities to pay such salaries as will afford an adequate remuneration for the proper discharge of the duties which devolve upon the officers."

It appears that during the year ended on the 31st of March last, the sum of 71,953*l.* was distributed out of this grant in aid of the payment of salaries of Medical Officers of Health and Inspectors of Nuisances.

During the year the Engineering Inspectors of the Board held local inquiries in respect of 451 applications by Sanitary and other Authorities for sanction to borrow money for public works. We are glad to learn that the special Survey of Sanitary Districts which was mentioned in the Board's last Report as being in progress, in view of the possible introduction of cholera into this country, was continued during the year on the same lines as in 1885, with the result that upwards of 550 districts have now been visited, and the respective Authorities have since been communicated with as to the most pressing sanitary needs which the survey brought to light.

With regard to the third section of the Report, "Local Taxation and Valuation," it appears that the aggregate receipts of the Local Authorities during the financial year 1884-85, excluding loans, amounted to 43,849,181*l.* The total amount of loans out-

* London: Printed for Her Majesty's Stationery Office by Eyre & Spottiswoode.

* We are afraid that this state of things still obtains.

standing at the end of the same period was 173,207,968*l.*, as compared with 92,820,100*l.* at the end of the year 1874-5,—an increase of eighty millions in ten years.

The appendices to the Report contain a great mass of detail as to the work of the Board and its officers, including the report on the Metropolitan Water Supply for the year 1886 by Major-General A. de C. Scott, the Water Examiner, appointed under the Metropolis Water Act, 1871, in succession to the late Sir Francis Bolton. From this report we notice that "constant supply" has been greatly extended over the systems of nearly all the companies providing the metropolis with water.

REFUSE DESTRUCTORS AND THEIR RESULTS UP TO THE PRESENT TIME.

THIS was the subject of a paper read by Mr. C. Jones, Assoc. Inst. C.E., Ealing, at the recent annual meeting of the Association of Municipal and Sanitary Engineers, and the discussion of which was postponed to the district meeting held at West Bromwich on Saturday last. We quote some passages from the paper:—

It must be taken as an acknowledged fact that there is some difficulty in constructing a suitable furnace for burning refuse, and there is little doubt that the experience of many years gained by "Fryer's Destructor" has done immense service, if not actually made this particular system a success. Turning to the several inventions brought out, it would appear at first sight that the object sought to be carried out was simple and easily to be performed; but after trials sometimes extending over two or three years, and with different kinds of refuse at different towns, they have nearly all been at last abandoned. All these trials tended to show that we must move with the greatest caution in adopting any particular process.

Furnaces of the ordinary type were used in London districts and in Northern towns over thirty years ago, but most of these were built either by contractors or those who did not consider,—in a scientific way, at any rate,—the action of heat, and how to utilise the small combustible portion contained in refuse to burn up the larger quantity of less combustible material. The shape and general construction of the fire-brick arches were wrong, the arrangements for feeding were bad, and the flues and passages for gases were designed more by guesswork than calculation. It is, therefore, no wonder that these proved to be only feeble attempts to introduce the principle of fire. It was found necessary to burn coal or other fuel in these furnaces in order to dispose of the refuse as collected, and they were ultimately used only for burning paper, straw, hampers and baskets, and other light materials, and several are used for that purpose at the present moment. One of these furnaces was built by the Corporation of Manchester about 1873, and many alterations were made from time to time. After three or four years' experiments, about the year 1876, Mr. Fryer, of Nottingham, appears to have come upon the scene of action and arranged with the Corporation for a trial of his furnace, which he named the "Destructor." This trial turned out sufficiently successful to induce the authorities to have another erected, and in a very short period they had no less than three large destructors built upon Fryer's patent.

The Birmingham Corporation followed next; then came Leeds and Bradford. These destructors have been seen by most of the members of this Association, and called forth a very able paper from our late esteemed friend Mr. Morant. About this date Messrs. Pearse & Lupton, of Bradford, invented a furnace for dealing with town refuse, and the Corporation (of which Mr. Pearse was then a member) allowed them 50*l.* for a six months' trial of their invention. These furnaces consisted of fire-brick arches, feeding hoppers, and regulating dampers, with perforated fire-brick walls at the back of each cell. The inventor claimed many advantages, and especially mentioned the perforated wall for dealing with offensive gases.

The trial appears to have been conducted upon fair lines. The Sanitary Committee instructed one of its officials to remain with them and note the quantity of work done, the wear and tear of cells, and the amount of smoke and smell given off; and the inventors were allowed to engage their own men and work the apparatus in any way they thought proper. Although several improvements were made, and a fair amount of refuse burned, they abandoned the trial.

The next invention was that of Pickard, who had been employed by the Leeds Corporation as foreman at the Destructor works; he called his refuse destructor the "Gourmand," and it consisted of a large fire arch with two sets of furnace bars and two furnace mouths to one cell. Although there was nothing to favour this form of cell, there was certainly one part of his invention which is of the highest importance, and that is the flues and second fires; he conducted his gases from the cells down an horizontal flue and erected two ordinary fireplaces in this flue with the fires crossing it, or the fire-bars at right angles to the flue. If he had built his furnace carefully, and made continuous practical trials, he would probably have adopted several other features contained in the "Fume Cremator," and thus have solved that part of the problem in advance of the author.

Immediately afterwards Healey brought out his refuse furnace, and the author found that Mr. Healey was engaged as assistant to Mr. Bryan when at Blackburn, and the erection of a "Fryer" was carried out at the time. An agreement was made with the makers, and a furnace called Fryer's and Healey's destructor was erected at Bradford. The arches and furnaces were like Fryer's, and following in the steps of the two previous inventors it was attempted to purify the gases. The main arch was constructed hollow over the top; the gases were made to pass at the back of each cell down the sides and over the arches, and the high temperature of the arches and flues was to have destroyed the offensive gases. This, however, did not take place, and although this destructor has been altered and experimented upon at great expense, no advantages have hitherto been obtained.

Then followed Thwaite, with a boiler and refuse furnace combined. It consisted of a vertical boiler with a hopper in the centre at the usual place for the chimney, and the heat of the boiling water and hot gases were said to prepare the refuse for combustion.

Then came Young, of Glasgow, with his refuse furnace, consisting of an ordinary furnace with closed ashpits. Air is blown into this ashpit by a powerful fan, and combustion thus facilitated. The refuse burnt is composed of paper, straw, and light materials, and is readily consumed, whilst the cinders are picked out and burnt under an ordinary boiler. The author believes that Mr. Hewson, of Leeds, made the blowing of air under the ashpits a principal part of his patents taken out last year.

The next to enter the field was Mr. Wilkinson, of Birmingham; he had considerable experience with two kinds of furnaces, viz., Fryer's destructors and Fryer's carboniser, and it was thought his inventions would contain some advantages over those already used by his Corporation. They consisted of cells with fire-brick arches and flat fire-bars, with large double furnace mouths and a perforated wall at the back of each cell, similar to that invented by Pearse and Lupton, and Mr. Wilkinson spoke so high of their use that the Corporation of Blackpool were induced to erect one about two years ago. These furnaces have been found to cost a great deal for repairs, and will probably be abandoned and replaced by Fryer's this year.

The next inventor was Burton, who constructed a long single furnace with two fires, and the refuse was dragged through by a long endless chain, which was moved at intervals by a windlass as the refuse became consumed. It is evident that no great heat could be generated, or the chain would be burnt and the process stopped.

Then followed Stafford and Pearson, of Burnley, with the "Beehive," which is so familiar to our members that it is unnecessary to describe its construction.

In the valuable digest prepared by Mr. Clavey, of Burton-upon-Trent, for his Board in 1886, under the head of Burnley, where the "Beehive" was born, in answer to the query as to whether "the destructor gives satisfaction," the reply is, "It gives every satisfaction"; but on turning to Leicester, where it was in the hands of one of our most experienced officers, I find the reply to the same question as follows, that "the Beehive did not give satisfaction, and had been demolished."

At Bradford, "the Beehive was abandoned within three months of its erection, on account of the excessive cost of working it."

Details are given in a tabulated statement supplied by Mr. Gordon as to the experiments carried out at Leicester with the Beehive, which did not give satisfaction. Turning to Richmond, where, in answer to similar questions, the reply is, "They had two Beehive destructors, which did not give satisfaction, and were closed on account of several law actions." The author took the trouble to visit the Beehive destructor at Burnley, thinking that he might be induced to have it at Ealing, and the answers just given justified the opinion he then formed. A few weeks subsequently to the opening of the Beehive at Richmond, the author was invited by the Vestry, who sought his advice in conjunction with Dr. Tidy, in connexion with a law action. The Vestry found that the best remedy was to close them.

The manufacturer of the Beehive subsequently invented the "Nelson." The author has no personal knowledge of this apparatus, but one was erected in the town of Nelson as a private speculation, and like the others referred to appears to have found no great favour.

Another apparatus was invented by Hardie, of Burnley, and consists of the old saddle boiler with an inclined furnace underneath, and he proposed to do away with chimneys by adopting the air-blowing principle, somewhat like Young & Co., Glasgow.

Mr. Jacob, Borough Engineer of Salford, designed a furnace for burning sewage sludge, also town refuse; but from what I can gather, the Corporation, after investigation, decided to erect a "Fryer" in preference. Its construction was upon the limekiln model, and is illustrated in a late volume of the "Proceedings of the Institution of Civil Engineers."

Next on the list is Ogden, of Burnley, with a refuse furnace constructed with two fires and a boiler over the top: he claims several advantages over all others; first, the burning of offensive gases by passing them through a coke fire, and also the carbonising of refuse and retaining its fertilising properties.

Finally, we have Horsfall, of Leeds, with an ordinary furnace with closed ashpit and the combustion maintained by a combination of steam and air being blown in under the fire-bars. This principle was tried in Manchester in 1876, in Warrington in 1880, and has been in use at Rochdale since 1881, under boiler furnaces that are burning screened refuse. There have been numerous other refuse furnaces invented, but as they have not been placed before the public, there is no need to name them.

Having enumerated, so far as has been ascertained, all the various destructors brought before the public, it is found that at the present time there are probably not more than about thirty of every description in use in England, varying in size from two to twelve cells, and the various models actually in use, so far as can be gathered, consist of Fryer's, Healey's, the Beehive, the Nelson, and the one at Birmingham known as the "Wilkinson." Consequently the subject appears at first sight to be one of great simplicity, but a few minutes' consideration will convince every one present who has had to deal with the difficulties that gather around this matter, that it is no easy thing to reduce into ordinary space the many questions that of necessity arise. Those who are engaged in the larger towns of England, such as Manchester, Birmingham, Leeds, and London, are fully alive to the immense difficulties which have to be coped with in settling what may be called the dustbin nuisance. Whilst our towns and the suburban parts of our district were content, and shoots were without difficulty provided, whilst sanitary science had not yet distended its nostrils to gather up every whiff borne upon every wind that tells its tale of what ought not to be, and whilst thousands of tons of refuse garbage were transported from our neighbourhoods and dealt with as circumstances might dictate or necessity require, in somebody else's neighbourhood, it was well; but that time has for ever passed away, and the absolute necessity of dealing with this growing difficulty has come home in a very painful manner to most of our local authorities, whether they be constituted under the powers of the Public Health Act, or the Metropolis Management Act of London.

It is during the last ten or fifteen years these difficulties have principally cropped up; and

upon referring to data supplied by Mr. Santo Crimp, in which he includes some twenty-five towns (omitting Manchester and Birmingham, which were of still earlier date), it appears that among the early destructors erected was the one built in Leeds in 1877. The next in date are another at Leeds in 1879, and others in Heckmondwike and Warrington in the same year. Then follow Blackburn, Bradford, and Bury in 1881; Bolton, Hull, Nottingham, and Salford in 1882; Ealing 1883; Newcastle, Preston, and Whitechapel in 1886; and I believe that Bournemouth, Batley, Longton, and Battersea, with other towns, are now erecting or are upon the point of erecting destructors.

It was at one of the meetings of the Association at Leeds, under the presidency of the late Mr. Morant, that the author first saw Fryer's destructor, and the difficulty experienced at Ealing, not only with the house refuse, but with the sewage sludge, led the author to look for a remedy in the apparatus there seen at work. Very shortly his Board let him have the destructor, and a 2-cell destructor was built. The author then endeavoured to settle the sludge question, and can only repeat what has been said again and again, that he found the destructor absolutely certain in its work, and saw that he had secured a most valuable appliance, and one by means of which he could without difficulty rid himself of a most unendurable nuisance and continual expense. It was soon found that a 2-cell destructor was not sufficient for the author's purpose, and consequently the next season two more cells were erected, and at the present moment the destructor at Ealing is dealing with the sewage sludge of a population of 19,000 and the house refuse of 22,000. The adoption of this mode of dealing with sewage sludge has produced a great deal of discussion and not a little difference of opinion. This latter remark refers more particularly to the Metropolitan Board of Works, who, having heard something of what the author was doing, tried some experiments for themselves, and, attempting to burn their sludge in a Hoffman kiln, signally failed, and Mr. Dibdin states that it was the cause of offensive effluvia and could not be carried out without a nuisance. The author cannot help expressing surprise that the Metropolitan Board of Works, with all their resources of wealth and engineering skill, should not have carried out their experiments in all integrity and with the best appliances that could be had. The dealing with the metropolitan sewage was a question of multiplication of power, and the author is still of opinion that the gigantic sludge barges now being built will have to give way to a more scientific mode of dealing with the difficulty than that of carrying the sludge out to sea and there precipitating it for the benefit of the finny denizens of the deep or to be encountered by unfortunate passenger vessels.

During the years the author has been burning sludge at Ealing he has never used a press, nor has he used any other fuel in the destructor than that supplied by the house refuse. A very few days after the sludge has been pumped on to the ash beds, all the draining and drying necessary has taken place, and the material burns readily. In corroboration I may quote an extract from Dr. Tidy's lecture at the Society of Arts, April 14th, 1886:—

"To my mind, the destructor has reached its highest state of perfection at Ealing, from the great thought that Mr. Jones, the Surveyor at Ealing, has given to it. His sludge there is mixed with house refuse, and burnt. Mr. Jones's view is that *every town produces sufficient house refuse to burn the sludge*. One has to notice the differences of destructors. I have seen a good many myself, and I should say the differences are mainly two; first, a certain escape of offensive vapours from the shaft, and I think those offensive vapours are mainly due to partial burning,—the destructive distillation, as a matter of fact, of the materials, instead of their complete destruction; secondly, the escape of fine sand and such like from the shaft at certain stages of the operation. I have seen those two nuisances very well marked, and I had occasion to advise on them on more than one occasion. I cannot help thinking myself that in Jones's destructor, where he places a muffle furnace or 'fume destroyer,' as he calls it, between the furnace and the main shaft, he has, in a great measure, met those two difficulties."

The author would call attention to one of the most valuable papers which has appeared in the scientific world upon this question, viz., the report made by the well-known scientist, Dr. William Odling, at the request of the Bradford Authority, who had both Fryer's and Healey's destructors at work. Those who have gone into this question closely know that one of the difficulties to be contended with is one springing from the sensitiveness which is felt by the authorities of almost every town when the question of smell is introduced; although no one can, for a moment, expect to go into sewage works or the dustyard of any important town and find it smelling sweet as lavender. There does seem to be a very strong feeling that it is an impossibility to put up a destructor without creating an intolerable stink, and there has been admittedly some slight ground for the statement. Those who were in the committee-room of the House upon the Kensington Vestry Bill will remember the awful and heartrending accounts by some of the opponents of the scheme as they detailed the horrors that would arise in the erection of a destructor. This apparently happened at Bradford, and so Dr. Odling was called in to decide the question. The following are his conclusions:—

"1. The furnaces should be of the same general form and dimensions as those at present in use. They should not, however, be built in double blocks back to back, but in single blocks, so as to be readily accessible both at back and front.

2. The drying up of the fresh refuse in the furnaces, before its actually taking fire, should be better provided for, and the moist vapour given off by the drying, instead of being allowed to escape at once into the main flue, should be caused to pass over and through the mass of actively burning refuse. This would effect several desirable objects. The incipient burning of the refuse would, in the first place, be less and less objectionable in proportion to the dryness of this refuse. Secondly, any possible offence from the discharge of the vapours given off in the mere drying would be provided for. Lastly, the passage of the watery vapour or steam given off in the drying, through the actively burning portion of the refuse, would tend to make this portion burn with a flame, a very desirable result as an aid to the destruction of the empyreumatic vapours given off in the stage of incipient burning. At present, the foreman in charge occasionally delivers, with some such view, a jet of water on to the actively burning refuse, but the continuous passage through this burning refuse of the watery vapour given off in the drying of the fresh refuse would be far more efficacious.

3. The opening into the flues leading from the furnace to the main flue should be so situated and arranged that the smoke and vapour given off by the incipient burning, together with a sufficient supply of air, should be caused, on its way into the flues, to pass over the most actively burning portion of the refuse, and thereby get almost, if not quite, comp'etely consumed.

4. The flues into which the products alike of the drying, the incipient burning, and the active burning first pass from the furnace on their way to the main flue should be of some length, but of no greater size than necessary, and be constructed with a view to their being maintained at as high a degree of heat as practicable. It is to these strongly heated flues that the complete destruction of any residue of unconsumed empyreumatic vapour must be entrusted. No amount of mere heating, however, will of itself cause their destruction. They must be sufficiently strongly heated in admixture with a sufficiency of air in order to effect their burning or destruction. The flues serving for this purpose might also be made available to aid in some measure the drying up of the fresh refuse passing into the furnace."

From the very first invention to the last, there have been attempts made to deal with the difficulties arising from the gases given off from burning refuse; and besides those named with the inventions specified, there have been many schemes tried both by the authorities who have them in use and the inventors. Fryer patented a method of water spray a few years ago; the water was distributed in a kind of shower by a revolving shaft in the centre of a chamber to which the gases were conducted like an ordinary shower-bath. Another invention was introduced by an engineer in Salford, who conveyed the gases over a long water channel and baffled them with revolving discs or wheels. This invention claimed not only to deodorise the gases, but to precipitate and retain the ammonia in the water or other fluid. Mr. Hewson at one time strongly recommended this invention. All these experiments and inventions point to one end, and all of them were more or less puffed up; several corporations were unfortunate enough to give them a trial, probably led on by the sanguine statements of the makers; but we have the evidence and experience of our fellow-engineers who have worked them, which is of the greatest value to the members of this Association, and at once gives a clear and honest account of their capacity after they had left the hand of the inventor or manufacturer. In placing these facts before the meeting, the author has endeavoured to give them in a fair and practical manner, and with a desire to call attention to those inventors who have conceived the idea of passing gases through and into separate furnaces. It will, however, be seen that most of them simply suggested an ordinary coke furnace, and the author's first experiments were conducted with a fire of this kind; but although considerable power was found in such a furnace, there were many details which required further development before practical success was attained.

An ordinary furnace was found to consume an enormous quantity of coke, and at once raised the cost of treatment to more than double, while the heat generated passed away into the chimney without utilising all its power to consume the offensive yet burnable gases. Therefore it was necessary to consider how an arrangement could be contrived which would reduce the consumption of coke and would effectually destroy offensive gases; in other words, a muffle furnace was wanted which could be retained at a very high temperature ready to receive the vapours and gases at any time, and keep them inside it sufficiently long to thoroughly deodorise them; and all this had to be effectually done with a small consumption of fuel, with no extra cost for labour, and with no great increase of wear and tear.

In his experiments the author found that gases were very similar to wind, and that by baffles they could be conducted in any direction; it was found that if they could be baffled and deflected without injuring the speed or draught, they might be kept sufficiently long in the furnace to consume and deodorise their offensive properties. It was also found by the regulated admission of oxygen that the fire could be maintained at one glowing temperature with a small consumption of coke and even breeze, and that it required very little attention. It must be left to others to say the author has succeeded in those very important points referred to by the following independent and disinterested authorities.

In evidence before a Select Committee of the House of Commons, Mr. T. Codrington, M.Inst.C.E., one of the Inspectors of the Local Government Board, said:—"He noticed improvements in many ways, and thought Fryer's with all the latest improvements was one suitable for doing its work, and considered the 'Fume Cremator' a very great safeguard against nuisance or annoyance, as it much increased the heat, and enabled a more thorough destruction of noxious gases and half-burnt paper and other things which escape."

Mr. Alfred Fletcher, Chief Inspector under the Alkali Acts, and Mr. John T. Harrison, Inspector under the Local Government Board; Mr. Alfred Fryer, inventor of the destructor, and numerous others, have spoken highly of the fume cremator; and I can only follow their remarks by inviting the members of this Association to come at any time and judge of its merits themselves.

Finally, the results have entirely, so far as the destruction of the gases is concerned, confirmed the view taken by Dr. Odling; and further, the whole of the machinery is worked by the steam obtained from this simple apparatus. The author need hardly remind engineers how valuable the results thus obtained may be where power is required, and the ease with which the power may be utilised as circumstances dictate.

The paper was supplemented by a selection from a mass of information the author has received upon the subject, contained in a report by Mr. W. G. Laws, City Engineer, Newcastle-on-Tyne.

We postpone our report of the discussion.

SHEFFIELD SOCIETY OF ARCHITECTS AND SURVEYORS.

A MEETING of this Society was held on Wednesday, 31st August, at the School of Art. Mr. J. B. Mitchell Withers presided.

The meeting was well attended, members were enrolled, and the following officers for 1887–8 elected:—

President.—Mr. T. J. Flockton, F.S.I.

Vice-President.—Mr. F. Fowler, F.S.I.

Treasurer.—Mr. J. B. Mitchell Withers, F.R.I.B.A.

Secretary.—Mr. W. C. Fenton.

Council.—Mr. C. Hadfield, F.R.I.B.A.; Mr. C. J. Innocent, A.R.I.B.A., F.S.I.; Mr. J. D. Webster, F.R.I.B.A.; Mr. E. M. Gibbs; and Mr. E. Holmes.

It was resolved, on the motion of Mr. E. M. Gibbs, seconded by Mr. B. H. Wightman,—"That the Council ascertain the terms on which the School of Art Council would allow the use of their committee-room and library for reference."

A vote of thanks to the chairman concluded the proceedings.

THE PROGRESS AND POSITION OF SANITATION.

LETTER FROM THE QUEEN.

MR. EDWIN CHADWICK, C.B., as President of the Association of Public Sanitary Inspectors, has received the following letter in acknowledgment of a Jubilee Address of congratulation presented to Her Majesty by that body:—

"Whitehall, August 20, 1887.

SIR,

I have had the honour to lay before the Queen the loyal and dutiful address of the President, Chairman of the Council and Members of the Council of the Association of Public Sanitary Inspectors for England and Wales, on the occasion of Her Majesty attaining the fiftieth year of her reign, and I have to inform you that Her Majesty was pleased to receive the same very graciously, and to command me to express her gratification at the results referred to as springing from the administration of the laws dealing with sanitary matters to which she has signified her assent.

I have the honour to be,
Sir,
Your obedient servant,
HENRY MATTHEWS."

In the Address referred to, the Sanitary Inspectors, after expressing their grateful sense of the blessings they had enjoyed in common with other of Her Majesty's subjects during her long and glorious reign, set forth that:—

"As humble executive officers, we have been enabled to aid in the practical application of the new sanitary science which has been first developed during your reign, with the powerful aid of your lamented Prince Consort, by which mainly, and with as yet very rudimentary and imperfect executive arrangements, the general health of your subjects has been far advanced beyond that of any great State of Europe or of the United States of America; that the mean duration of life of all your subjects has already been augmented by three years and a half; that on the last year's population of England and Wales there has been a saving of eighty-four thousand cases of deaths, and of more than one million seven hundred thousand cases of sickness over the average rates of death and the average sickness rates at the commencement of your Majesty's reign; that instances of general application have been presented of reductions of the death rates of the civil population by one-third and one-half; that by more complete applications of our science the death-rate of your Home Army has been reduced by more than one-half, and of your Indian Army by more than four-fifths, and that these experiences are available for the whole of the civil population of your Empire; that particular and decided examples have been achieved by the practical application of sanitary science, as displayed in district half-time schools, and by which far greater reductions of the present excessive infantile death-rates may be accomplished, and far greater reductions of the burthens of excessive sickness and deaths of all Your Majesty's subjects. By a further advance in the same lines, by superior sanitary education and inspection, it may be confidently anticipated that during the continuance of Your Majesty's reign still greater results may be achieved than those of the last half-century."

Illustrations.

DECORATIVE SCULPTURE FOR THE INDIAN PENINSULAR RAILWAY TERMINUS ADMINISTRATIVE OFFICES, BOMBAY.

THESE sculptured groups and statues have been executed in London by Mr. Thomas Earp, of the firm of Earp, Son, & Hobbs, for decoration of the exterior of the above-named terminal station, at Bombay.

The central figure of "Progress," 14 ft. in height, in three stones, is intended to hold in the right hand a flaming torch of copper, gilt, whilst the left hand rests upon a winged wheel by her side. This figure surmounts the central dome of the building.

The groups in the tympanums represent, the one "Science," embodying Astronomy, Electricity, Physical Geography, Medicine, Chemistry, Mechanics; the other "Trade," representing the central figure of Peace fostering interchange of relations between East and West, peace being an essential condition of Commerce.

The lion and tiger are for the gate piers of the entrance to the station, and measure 9 ft. 6 in. in length and 5 ft. 6 in. in height. The three groups below represent,—(1) "Commerce," the central figure expressing invitation and welcome, the left-hand figure holding Britannia's Trident, the right-hand figure with laurel wreath for successful enterprise; (2) "Agriculture": the central figure with cornucopia and ploughshare, "Plenty"; the left-hand figure with dibble and seeds, "Sowing"; the right-hand figure with sickle and wheat "Reaping"; and (3) "Civil Engineering," the central figure shown with cylinder of steam-engine; the left-hand figure "Military Engineering," with gunner's quadrant; the right-hand figure with screw propeller representing "Naval Engineering." These groups are 10 ft. in height and 8 ft. 6 in. in breadth, and in three stones each.

The figure of the Queen Empress (shown in annexed cut) is 9 ft. 6 in. in height, and in one stone. Her Majesty is represented in State robes and orders, holding in either hand the sceptre and orb.

Statue of Her Majesty, forming part of the Decorative Sculpture of the Indian Peninsular Railway Terminus, Bombay.—Mr. Thos. Earp, Sculptor.

In addition to the sculpture here illustrated there are decorative lions and griffins for the gables, and also nine large portrait heads, in circles, representing Lord Dufferin, Sir Bartle Frere, &c.

These works were carefully packed in strong iron-bound cases, and having arrived at their destination by steamer from London without sustaining damage, have now been placed in position.

The work has all been executed in Bath stone.

NEW CHURCH AT STRATTON.

THE new church now being built, from Mr. T. G. Jackson's design, at Stratton, in Hampshire, is to supersede a very mean modern structure of brick, which stands on low ground in Stratton Park. The new church, which is being erected at the expense of the Earl of Northbrook and the Hon. Francis Baring, is situated on higher ground, nearer the village. The materials are brick, with flint facing and dressings of Chilmark stone externally, and of chalk internally. The spire is of timber and shingled. The seats and other fittings are to be of oak throughout.

The contractors for the general work are Messrs. Parnell & Son, of Rugby, and Mr. R. Evans is clerk of works.

NEW CHURCH AT NORTHINGTON, HAMPSHIRE.

THE present church at Northington, near Alresford, in Hampshire, is a modern structure of no particular architectural interest, though it was improved to some extent a few years ago by Mr. Butterfield.

It is now proposed to replace it by an entirely new church, from the designs of Mr. T. G. Jackson, which is to stand a few yards away from the present site. The new church, which is to be erected at the expense of Lord Ashburton, will contain sittings for 260 persons, and will be constructed of brick, with flint facings, and with dressings of Chilmark stone outside and chalk inside.

Our illustration is taken from a sepia drawing by the architect, exhibited this year in the Royal Academy.

CLUB-HOUSE, SHIPSTON-ON-STOUR.

THIS building is about to be erected by the liberality of Mr. Frederick Townsend, M.P. It contains billiard-room, reading-room, recreation-room, kitchen, &c., on the ground-floor, and a public hall above, approached by two staircases, and having an open timber roof. In connexion with the hall is a retiring or green room, with an attic for stores, above. The walls are of red brick, the roofs covered with Broseley tiles. The timber is to be oak, cut upon the estate of Mr. Townsend, and the lowest tender (by Mr. John King, of Shipston-on-Stour) amounts to 1,064*l*. The architect is Mr. Ed. W. Mountford, A.R.I.B.A., of 22, Buckingham-street, Strand.

The drawing was in the exhibition of the Royal Academy.

A VILLAGE SHOP AND FOUR COTTAGES AT DOULTING, SOMERSET.

THESE buildings are designed (the cottages being already built) for a site in the village of Doulting, which belongs to Sir Richard H. Paget, Bart., M.P., and is renowned for its quarries of the excellent "Doulting" stone as well as for the ancient "Abbott's Barn."

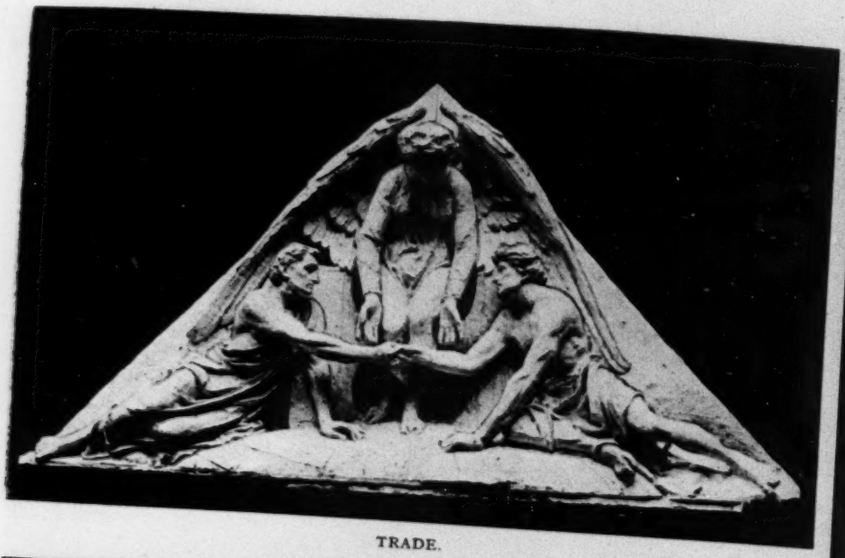
The accommodation in each cottage is, on the ground-floor, a porch, living-room (14 ft. by 11 ft.), kitchen, and pantry, and on the upper floor three bedrooms, each having separate access to the staircase. The shop is about the size of two cottages, and is situated facing the church and two main roads, and being in the curve of two other roads is in a prominent position. The oriel window lights a sitting-room, whence a very pleasant view is obtained.

The materials are, for walling throughout, Doulting stone from Messrs. Charles Trask & Son's quarries, "hammer-dressed," with finely-wrought window and other dressings; the gable copings, tops of chimney-stacks, &c., are of the harder or weather beds of the Chelynch quarries. The roofs are covered with slates.

The ground on which the cottages stand naturally lies about 3 ft. above the adjoining road level, and an attempt has been made to turn this irregularity to account in the design. Mr. George J. Skipper, of Norwich, is the architect of the work, and Mr. F. W. Pullen, of Shepton Mallet, the contractor.

Gilchrist Engineering Scholarships.—We may draw attention to these scholarships, to be competed for at University College. The examination is intended to be such as can be passed by a well-taught school-boy fresh from school, and will be held on the 29th and 30th of September. Candidates must send in notice to the Secretary of University College of their intention to compete, not later than September 23rd. The scholarships are of the value of 35*l*., and tenable for two years.

The Lighting of the House of Commons. Mr. Plunket, the First Commissioner of Works, in answer to a question put by Mr. Graham last week, said that there was no doubt that the use of gas in the cloister used as the cloak-room was doing a certain amount of injury to the stonework of the roof, and he quite agreed as to the advisability of substituting electric lighting. Unfortunately, there was the odious question of expense, and he had been for some time engaged in having estimates prepared which he hoped very soon to submit to the proper authorities.



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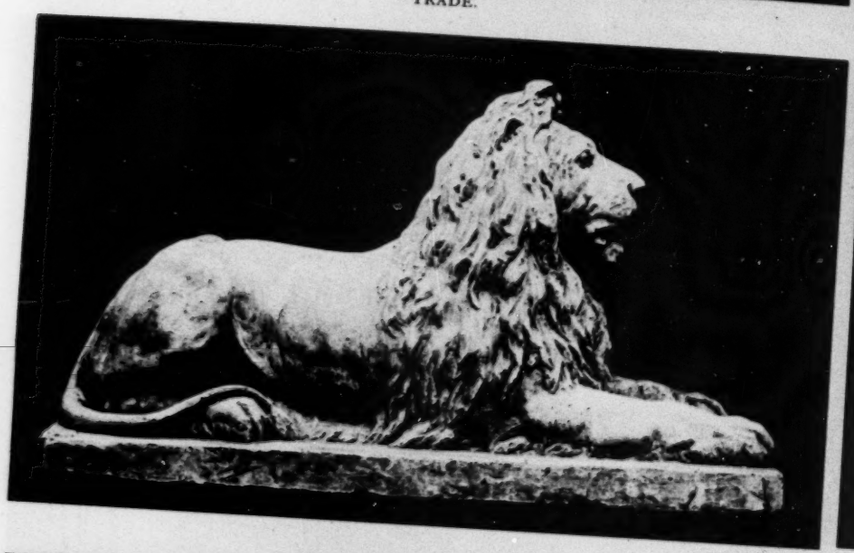

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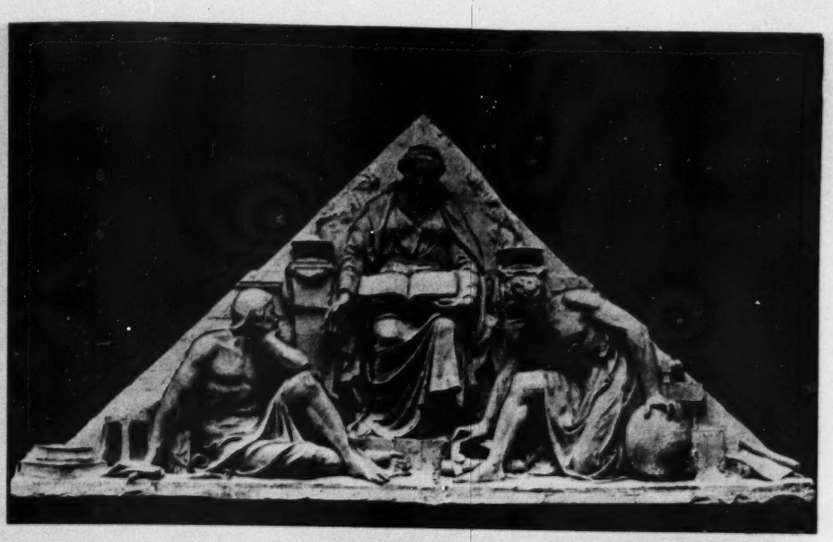
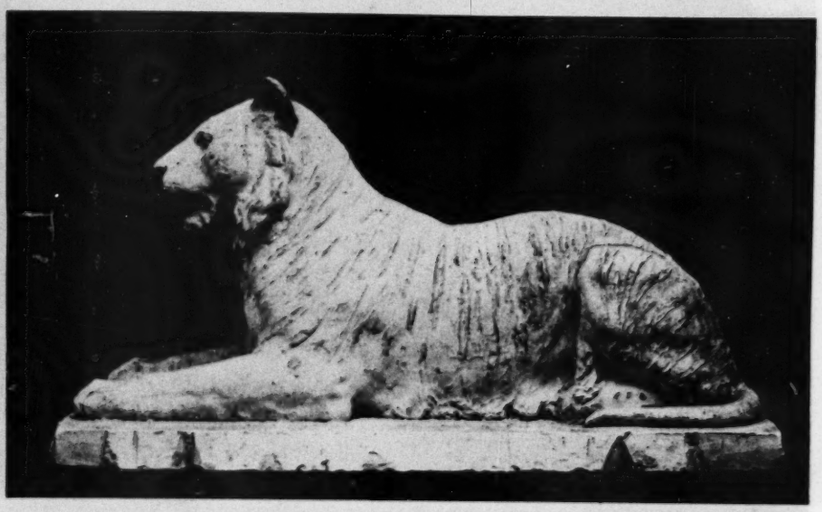
The Phototype Co.,

PROGRESS.



SCIENCE.



AGRICULTURE.

ENGINEERING.

N PENINSULAR RAILWAY COMPANY'S TERMINUS, BOMBAY.

Architect. Mr. THOMAS EARP, Sculptor.

pe Co., 903, Strand, London.

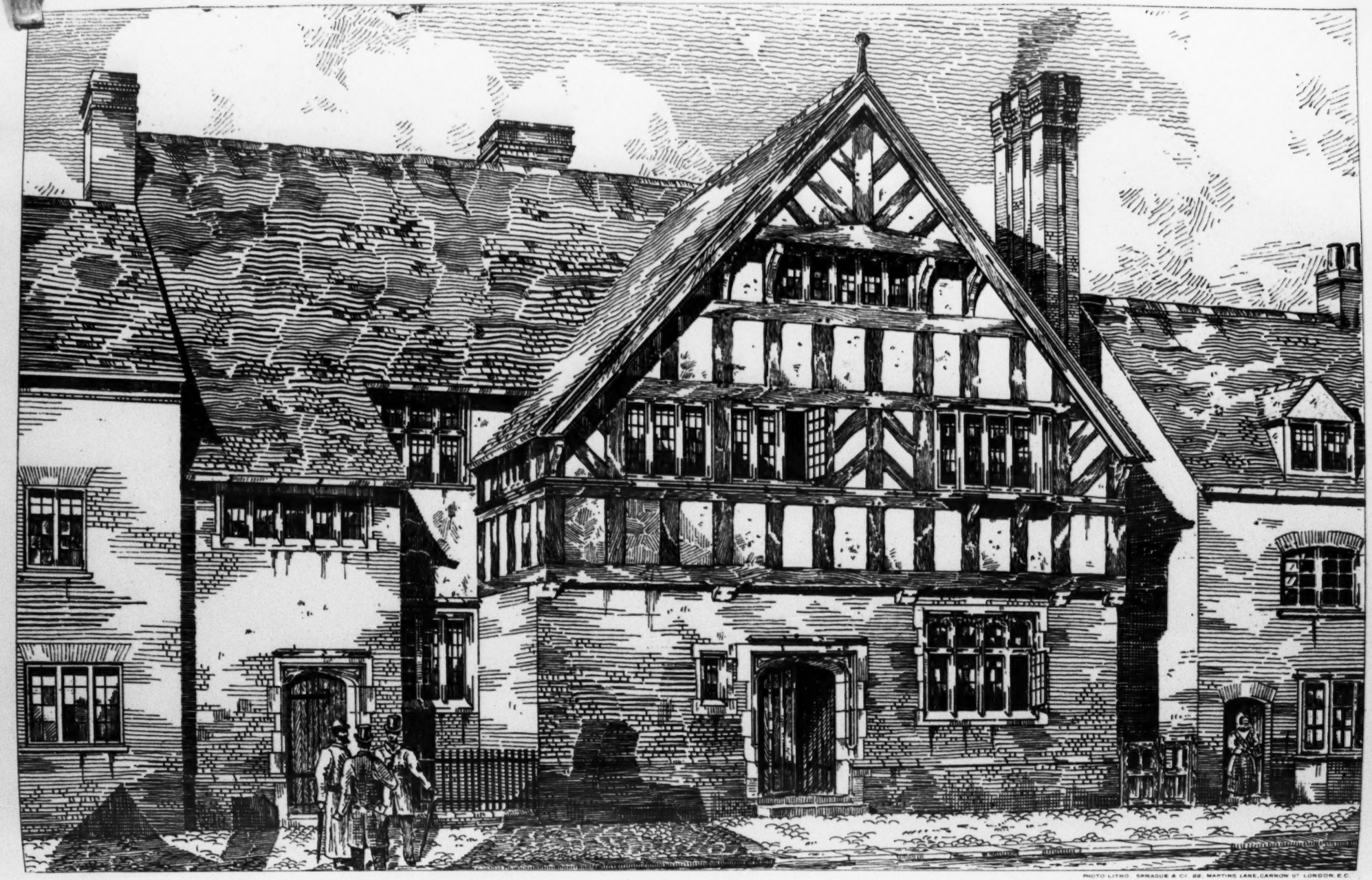


PHOTO-LITHO. SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON, E.C.

CLUB HOUSE, SHIPSTON-ON-STOUR.—Mr. E. W. Mountford, A.R.I.B.A., Architect.

CLUB HOUSE, SHRIVENHAM

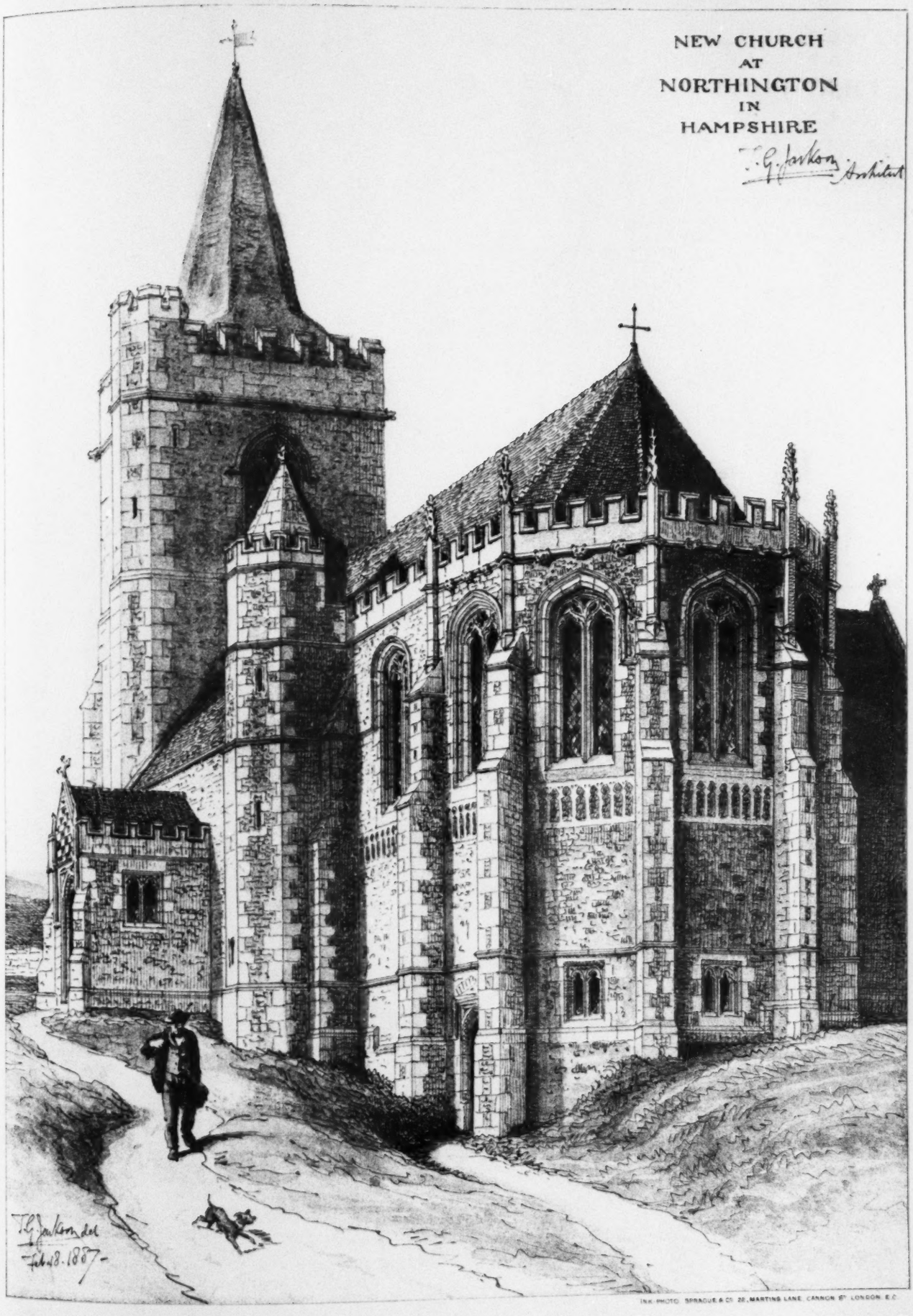
NEW CHURCH AT STRATTON IN HAMPSHIRE

Thos. G. Jackson. Architect
Feb. 10. 1887.

"RA" PHOTO" SPRAGUE & CO. 62, MARTINS LANE, CANNON ST. LONDON, E.C.

NEW CHURCH AT NORTHINGTON IN HAMPSHIRE

T. G. Jackson Architect

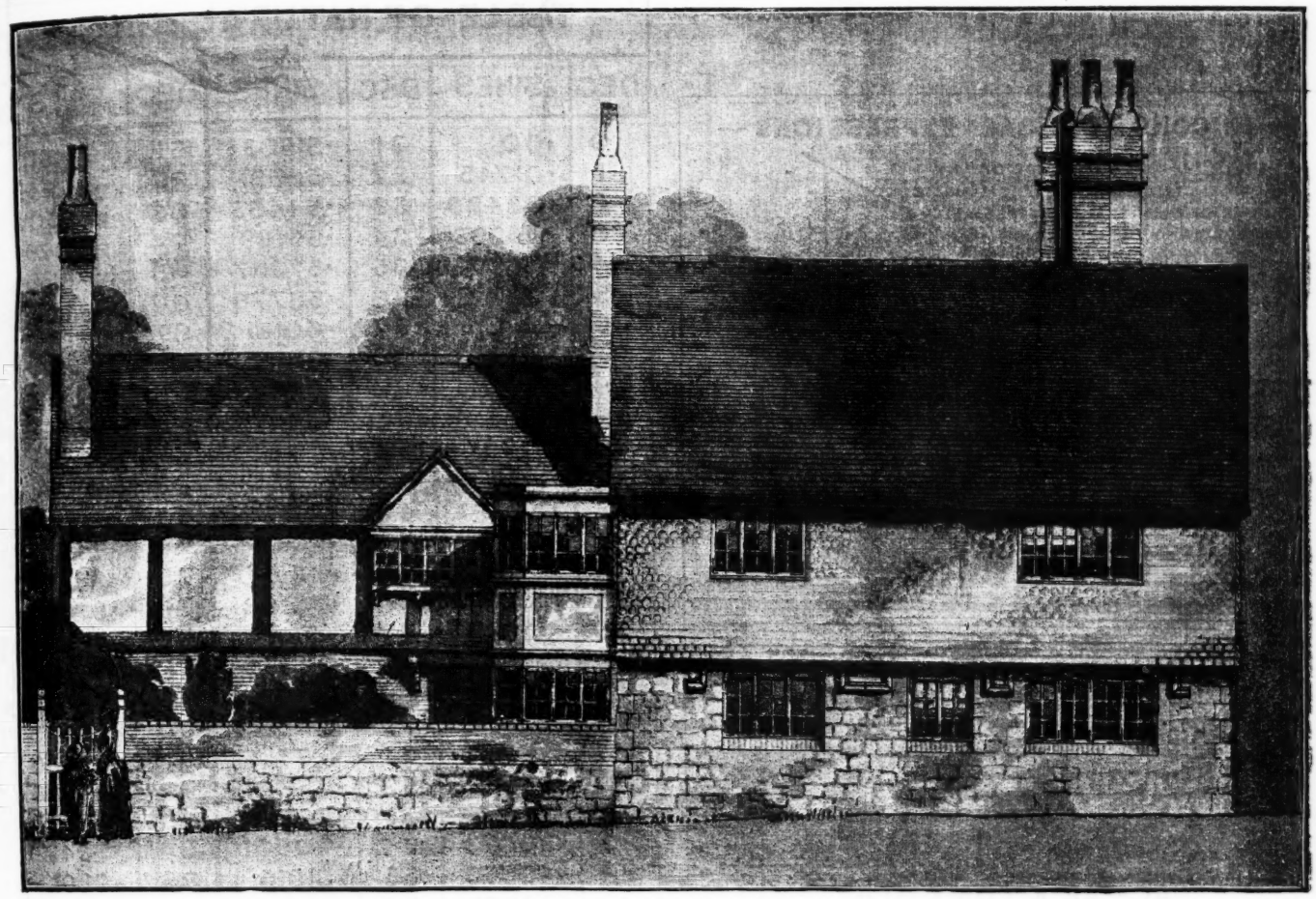


T. G. Jackson del. Feb 28. 1887.

INK PHOTO SPRAGUE & CO. 28, MARTINS LANE, CANNON ST. LONDON, E.C.

A Village Shop & 4 Cottages
at Doulting Somersetshire.
for Sir Richard D Paget Bart M.P.
George J Skipper Architect

PHOTO-LITHO. SPRAGUE & Co 22, MARTINS LANE, CANNON ST, LONDON, E.C.



Alterations and Additions to a Cottage at Haslemere, Surrey.—Mr. W. A. Pite, Architect.

COTTAGE, HASLEMERE.

THE illustration shows additions made to an ancient cottage at Haslemere, for Mr. Rayner Storr, who has rescued the premises from continuing as a double tenement.

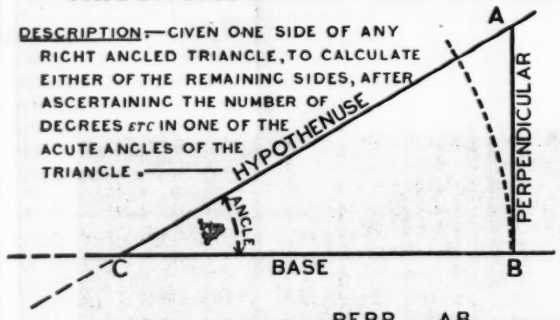
The ground story is stone, while the upper part and roofs are oak framed and tile hung. The house has many levels. The work was carried out under the superintendence of Mr. William A. Pite.

The small drawing from which the cut is reproduced was hung in the Royal Academy Architectural Room this season.

MECHANICAL SCIENCE AND THE EDUCATION OF ENGINEERS.

IN the Mechanical Science Section of the British Association Meeting at Manchester last week, the President of the Section, Professor Osborne Reynolds, in the course of his inaugural address, reviewed the achievements in mechanical science accomplished since the last meeting of the Association in Manchester, twenty-six years ago. It was always difficult, he said, to arrive at a just appreciation of the relative importance of the events of our own time; and in any endeavour to review or take stock of the mechanical advance of the last quarter of a century, during which time things mechanical had divided the attention of the civilised world with matters political, it seemed very necessary to remember that as the mechanical age got older its relative activity was not to be gauged by the relative number and importance of such epoch-marking mechanical departures as compared with those which had distinguished past periods. However high or low an estimate we might form of the probable future importance of some of these inventions, and however much disappointment we may feel at the non-success which has attended some of the boldest and apparently most promising departures, such as the Crampton process for substituting a blast of coal dust for the ordinary furnace, or Sir Henry Bessemer's endeavours to prevent distressing motion at sea, there was still no ground for discouragement. For whether or not this period be henceforth remarkable for what may be called the origination of new mechanical species, is a small matter compared with the fact that it had undoubtedly been remarkable for unprecedented achievements in the development of higher states of organisation in those mechanical species which were already in existence. There has never been a time in which mechanical revolutions had followed one another with such rapidity. In all the main departments of practical mechanics progress had been so rapid that appliances have been superseded long before reaching the term of their natural existence. . . . That the character and rate of recent mechanical advance were both exactly such as would be expected to follow, as the result of a deeper and broader knowledge of scientific methods and the principles involved, seemed to be the very best proof of advance in that other side of mechanical science in which this section took interest, or, more correctly, for which it exists, —the increase and spread of mechanical knowledge. Elementary education, whatever might be its subjects, must of necessity depend for its permanent existence on some source of higher knowledge in those subjects. Without raising such questions as whether there exist at present means of training efficient teachers in all the branches for which technical education is promised, or whether such means would be forthcoming as a result of the demand of teachers, he recalled the recent progress made towards a higher training in that branch of science which most directly relates to mechanical progress, and which, according to no less an authority than the late Professor Rankine, received its first impulse from the institution of Section G. Professor Gordon, who held the chair of mechanics in Glasgow University, was the first in this country to collect and embody in his lectures, and subsequently in a text-book, the important though scattered results of individual efforts to found the laws of practical mechanics on exact science. And at the time Rankine was speaking, the chair to which Rankine himself was called the same year was the only chair in this country from which such lectures were given. Since that time the appreciation of that science has steadily increased; other colleges took up the subject mostly as forming part of courses entitled engineering or naval science. Amongst these was Owens College, in which, not till after the last meeting in Manchester of this Association, the leading engineers founded and endowed, which is more important, the chair which it has been my fortune to occupy for nineteen years. During the earlier part of this time both teachers and students were labouring under the disadvantage arising from the novelty of the subject,—the former having to make an almost arbitrary selection of what they would teach, and the latter not knowing exactly what it was they were going to learn. Gradually, however, by the help of experience from the somewhat earlier French schools and with the admirable works of Rankine as a foundation, the lectures or theoretical courses had become clear and distinct, while the advantage to be gained had become so generally recognised that of late years there had been almost a scramble to found new colleges to teach engineering, or to introduce such teaching into existing colleges; and most satisfactory to those engaged in the introduction of the subject was the fact that it was from engineers themselves that the interest and funds necessary for the work had come. Since 1867 the Owens College had received gifts and bequests from engineers, including those of the highest standing in the neighbourhood, of upwards of 150,000*l*. It could not for one moment be doubted that this movement had been brought about by the conviction of the necessity of an education which, in its subjects and methods of teaching, was much more closely related than was the older system of the universities, to the actual work which the students may eventually be called upon to undertake,—that it was, in fact, evidence of the appreciation, by those having the greatest experience, of the necessity of higher scientific training for engineers. This was what engineering schools during their struggle for existence had endeavoured to supply. And in spite of the danger which seems to beset all schools as they become older, to fall into the academic or pure,—not because it was the most desirable to be learned, but because it is by far the easiest to teach,—in spite of this danger, such in this case is the pressure from without, that it may be hoped the schools of engineering and applied science might be kept up to the mark, both in extending our knowledge of the laws and principles

—TRIGONOMETRICAL EXPRESSIONS—


DESCRIPTION:—GIVEN ONE SIDE OF ANY RIGHT ANGLED TRIANGLE, TO CALCULATE EITHER OF THE REMAINING SIDES, AFTER ASCERTAINING THE NUMBER OF DEGREES ETC IN ONE OF THE ACUTE ANGLES OF THE TRIANGLE.
A
HYPOTHENUSE
PERPENDICULAR
ANGLE
C
BASE
B

1. $\frac{\text{SIN ACB} = \frac{\text{PERP}}{\text{HYP}} = \frac{\text{AB}}{\text{AC}} = \text{COS CAB}}{\text{AB} = \text{AC} \times \text{SIN ACB}}$

2. $\frac{\text{COS ACB} = \frac{\text{BASE}}{\text{HYP}} = \frac{\text{CB}}{\text{AC}} = \text{SIN CAB}}{\text{CB} = \text{AC} \times \text{COS ACB}}$

3. $\frac{\text{TAN ACB} = \frac{\text{PERP}}{\text{BASE}} = \frac{\text{AB}}{\text{BC}} = \text{COT CAB}}{\text{AB} = \text{CB} \times \text{TAN ACB}}$

4. $\frac{\text{SEC ACB} = \frac{\text{HYP}}{\text{BASE}} = \frac{\text{AC}}{\text{CB}} = \text{COSEC CAB}}{\text{AC} = \text{CB} \times \text{SEC ACB}}$

5. $\frac{\text{COSEC ACB} = \frac{\text{HYP}}{\text{PERP}} = \frac{\text{AC}}{\text{AB}} = \text{SEC CAB}}{\text{AC} = \text{AB} \times \text{COSEC ACB}}$

6. $\frac{\text{COT ACB} = \frac{\text{BASE}}{\text{PERP}} = \frac{\text{CB}}{\text{AB}} = \text{TAN CAB}}{\text{CB} = \text{AB} \times \text{COT ACB}}$

TABLE OF NATURAL SINES

DEC	SINES	DEC	SINES	DEC	SINES
0	·00	31	·51503	61	·87461
1	·01745	32	·52991	62	·88294
2	·03489	33	·54463	63	·89100
3	·05233	34	·55919	64	·89879
4	·06975	35	·57357	65	·90630
5	·08715	36	·58778	66	·91354
6	·10452	37	·60181	67	·92050
7	·12186	38	·61566	68	·92718
8	·13917	39	·62932	69	·93358
9	·15643	40	·64278	70	·93969
10	·17364	41	·65605	71	·94551
11	·19080	42	·66913	72	·95105
12	·20791	43	·68199	73	·95630
13	·22495	44	·69465	74	·96126
14	·24192	45	·70710	75	·96592
15	·25881	46	·71933	76	·97029
16	·27563	47	·73135	77	·97437
17	·29237	48	·74314	78	·97814
18	·30901	49	·75470	79	·98162
19	·32556	50	·76604	80	·98480
20	·34202	51	·77714	81	·98768
21	·35836	52	·78801	82	·99026
22	·37460	53	·79863	83	·99254
23	·39073	54	·80901	84	·99452
24	·40673	55	·81915	85	·99619
25	·42261	56	·82903	86	·99756
26	·43837	57	·83867	87	·99862
27	·45399	58	·84804	88	·99939
28	·46947	59	·85716	89	·99984
29	·48480	60	·86602	90	1·00000
30	·50000				

COSINE A = SINE (90–A)

which more immediately underlie the results of practical experience in art, and in teaching the methods of most useful application; and that while encouraged to offer every inducement to the attainment of a sound knowledge of the principles, they would not be allowed to fall into the fatally easy errors of carrying the abstractions of this science outside all possible application, or blocking the way by the insistence on impossible preliminary attainments in mathematics and pure science. To be hailed as one of the greatest inducements to keeping alive in engineering schools a real scientific interest in the practical work which is going on around them was the introduction of what are now called engineering laboratories, in which students might familiarise themselves with the actual subjects for which the theoretical work was undertaken, and have placed before them in their most naked forms the data and mechanical actions in which practical achievements depend, as well as being taught the use of all those instruments and methods of measurement which it was one of the first objects of these laboratories to extend and to perfect, and which measurements are now, as the result of a better knowledge of principles, rapidly displacing the older methods of arriving at conclusions in engineering. During the erection and fitting of the Whitworth Laboratory in Owens College, which was now on the verge of completion, it had been very impressing to see the goodwill shown toward the work by everybody who had had to do with it. Everyone who had paid attention to the history of mechanical progress must have been impressed by the smallness in number of recorded attempts to decide the broader questions in engineering by systematic experiments, as well as by the great results which in the long run have apparently followed as the effect of these few researches. He said apparently, because it was certain that there have been other researches which probably, on account of failure to attain some immediate object, have not been recorded, although they may have yielded valuable experience which, though not put on record, has, before it was forgotten, led to other attempts. But even discounting such lost researches, it was very evident that mechanical science was in the past very much hampered by the want of sufficient inducement to the undertaking of experiments to settle questions of the utmost importance to general advance, but which had not promised pecuniary returns, scientific questions which involved a greater sacrifice of time and money than individuals could afford. To what all this might lead us it was no part of his undertaking to consider, but he ventured to end his address on the progress of mechanical science during the past twenty-six years by what appeared to him the most satisfactory conclusion, viz., that to such mechanical progress there is apparently no end; for, as in the past so in the future, each step in any direction would remove limits and carry us past barriers which have till then blocked the way in other directions, and so what for the time might appear to be a visible end or practical limit would turn out but a bend in the road.

Mr. W. H. Barlow, Past-President of the Institution of Civil Engineers, moved a vote of thanks to Prof. Osborne Reynolds, which was seconded by Mr. J. Abernethy, who remarked that the subject of technical education touched upon in the address was of the utmost importance. If we were to compete successfully with foreigners and Americans, the engineers of the future must be instructed, more than they had been in the past, in technical science or applied mechanics.

The resolution was carried.

The Student's Column.

LAND SURVEYING AND LEVELLING.

XI.—TRIGONOMETRICAL SURVEYING.

IF any two straight lines, such as A C and B C, intersect one another at the point C, and if, from any point in one of the lines such as B C, at any distance B from C upon the side forming an acute angle with the other line A C, we draw a perpendicular to meet the other line A C, a right-angled triangle will be formed, in which B C will represent the base, A B the perpendicular, and the A C the hypothenuse subtending the right angle.

Mathematical tables have been formed, giving the ratio between any two adjacent sides of a triangle, so that by the aid of these tables, when we know the length of any one side, and the value in degrees and parts of a degree of either of the acute angles A C B or C A B, we can arrive at the length of the adjacent side forming the angle, and then, having arrived at the length of two sides of the triangle, we can easily determine the length of the third side, either by a further use of these tables, or by the application of the 47th proposition of the first book of Euclid.

The trigonometrical values furnished by the tables are denominated as follows:—(1) the sine of the angle, found by dividing the length of the perpendicular by the length of the hypothenuse; (2) the cosine of the angle, found by dividing the length of the base by the length of the hypothenuse; (3) the tangent of the angle, found by dividing the length of the perpendicular by the length of the base; (4) the secant of the angle, found by dividing the length of the hypothenuse by the length of the base; (5) the cosecant of the angle, found by dividing the length of the hypothenuse by the length of the perpendicular; and (6) the cotan-

TABLE OF NATURAL COTANGENTS

DEC	COTAN	DEC	COTAN	DEC	COTAN
0	INFINITE	31	1·6642	61	·55432
1	57·2899	32	1·6003	62	·53170
2	28·6362	33	1·5398	63	·50952
3	19·0811	34	1·4825	64	·48773
4	14·3006	35	1·4281	65	·46630
5	11·4300	36	1·3763	66	·44522
6	9·5143	37	1·3270	67	·42447
7	8·1443	38	1·2799	68	·40402
8	7·1153	39	1·2348	69	·38386
9	6·3137	40	1·1917	70	·36397
10	5·6712	41	1·1503	71	·34432
11	5·1445	42	1·1106	72	·32491
12	4·7046	43	1·0723	73	·30573
13	4·3314	44	1·0355	74	·28674
14	4·0107	45	1·0000	75	·26794
15	3·7320	46	·96568	76	·24932
16	3·4874	47	·93251	77	·23086
17	3·2708	48	·90040	78	·21255
18	3·0776	49	·86928	79	·19438
19	2·9042	50	·83909	80	·17632
20	2·7474	51	·80978	81	·15838
21	2·6050	52	·78128	82	·14054
22	2·4750	53	·75355	83	·12278
23	2·3558	54	·72654	84	·10510
24	2·2460	55	·70020	85	·08748
25	2·1445	56	·67450	86	·06992
26	2·0503	57	·64940	87	·05240
27	1·9626	58	·62486	88	·03492
28	1·8807	59	·60086	89	·01745
29	1·8040	60	·57735	90	·0
30	1·7320				

TAN A = COTAN (90 − A)

TABLE OF NATURAL COSECANTS

DEC	COSEC	DEC	COSEC	DEC	COSEC
0	INFINITE	31	1·9416	61	1·14335
1	57·2986	32	1·8870	62	1·13257
2	28·6537	33	1·8360	63	1·12232
3	19·1073	34	1·7882	64	1·11260
4	14·3355	35	1·7434	65	1·10337
5	11·4737	36	1·7013	66	1·09463
6	9·5667	37	1·6616	67	1·08636
7	8·2055	38	1·6242	68	1·07853
8	7·1852	39	1·5890	69	1·07114
9	6·3924	40	1·5557	70	1·06417
10	5·7587	41	1·5242	71	1·05762
11	5·2408	42	1·4944	72	1·05146
12	4·8097	43	1·4662	73	1·04569
13	4·4454	44	1·4395	74	1·04029
14	4·1335	45	1·4142	75	1·03527
15	3·8637	46	1·39016	76	1·03061
16	3·6279	47	1·36732	77	1·02630
17	3·4203	48	1·34563	78	1·02234
18	3·2360	49	1·32501	79	1·01871
19	3·0715	50	1·30540	80	1·01542
20	2·9238	51	1·28675	81	1·01246
21	2·7904	52	1·26901	82	1·00982
22	2·6694	53	1·25213	83	1·00750
23	2·5593	54	1·23606	84	1·00550
24	2·4585	55	1·22077	85	1·00381
25	2·3662	56	1·20621	86	1·00244
26	2·2811	57	1·19236	87	1·00137
27	2·2026	58	1·17917	88	1·00060
28	2·1300	59	1·16663	89	1·00015
29	2·0626	60	1·15470	90	1·00000
30	2·0000				

SECANT A = COSEC (90 − A)

gent of the angle, found by dividing the length of the base by the length of the perpendicular.

If in the triangle A B C the hypothenuse A C represent the radius of a circle equal to unity, then the sine of the angle will be expressed by the length of the perpendicular, and the cosine of the angle will be expressed by the length of the base. But if the length of the base be a radius equal to unity, as shown in the diagram, then the length of the perpendicular will express the value of the tangent, and the length of the hypothenuse will express the value of the secant. Hence the names sine, tangent, secant, applied to these expressions, sine signifying a line opposite the angle, and secant a line cutting the circle.

In the case of the angle C A B, the line C B would become the perpendicular drawn from the point B, at a distance, B A, from the point of intersection A, to meet the line C A in the point C, and B A would become the base from which the perpendicular would be drawn. Hence the sine, tangent, and secant of the angle A C B become respectively the cosine, the cotangent, and the cosecant of the complement to the angle A C B; that is, of the angle C A B. Furthermore, it will be observed that in either angle the reciprocal of the sine is equal to the cosecant, the reciprocal of the tangent is equal to the cotangent, and the reciprocal of the secant is equal to the cosine.

It will also be observed that whatever the size of the triangle, provided the angles remain the same, these ratios will by the principle of similar triangles remain the same; so that when the length of one side is known, the length of the other sides in any particular triangle can be determined.

To facilitate the process of calculation, tables of *logarithmic* sines and cosines are published; but to explain our subject, it will be sufficient to refer only to the accompanying table of *natural* equivalents for whole degrees. Thus suppose we require the value of the cotangent for an angle of 62 degrees 27 minutes. By the tables,

$$\text{Cot } 62° = ·53170$$
$$\text{Cot } 63° = ·50952$$

$$\text{Difference for } 1° = ·02218.$$

$$\text{Approximate difference for } 27' = \frac{27}{60}\,(·02218) = ·009981.$$

$$\therefore \text{Cot } 62°\ 27' \text{ approximately} = (·53170 - ·009981) = ·521719.$$

To calculate this accurately we must express the cotangent in terms of the sine and cosine, as the tables to which we have to refer only state, when single minutes are required, the values of the sines and cosines of angles; thus,

$$\text{Cot } 62°\ 27' = \frac{\cos 62°\ 27'}{\sin 62°\ 27'} = \frac{·4625225}{·8866075}$$

The reduction of this vulgar fraction, which will be found equal to = ·5216767, will show the value of the application of logarithms.

The approximate result, ·521719, is seen to be correct for three places of decimals, but for application to the plotting of long base-lines the more accurate process must be applied.

Caucasus Wood.—A recent St. Petersburg journal comments on the increasing exportation of Caucasus wood, both nut-wood and palm-wood, which are sold by weight. The palm attains a height of 35 ft., and is not found in forests, but in isolated groups. The year 1883 showed exportations of nut-wood at 27,683 cwt., and palm-wood, 32,328 cwt.; while in 1885 the increase had run up to 36,370 cwt., and 61,252 cwt. respectively,—nearly double of the latter in the two years.

SANITARY CONGRESS AT BOLTON.

THE tenth Autumn Congress of the Sanitary Institute of Great Britain will be held at Bolton from September 20th to September 24th. In connexion with it there will, as usual, be an exhibition of sanitary apparatus and appliances, which will remain open until October 15th.

The following is the order of proceedings:—

Tuesday, September 20.

1 p.m.—Reception by the Mayor, at the Town-hall.
1·30 p.m.—Public Luncheon.
3 p.m.—Opening of Exhibition by the Mayor.
8 p.m.—First General Meeting; Opening Address by Right Hon. Lord Basing, F.R.S.

Wednesday, September 21.

Section I.—"Sanitary Science and Preventive Medicine."
10·30 a.m.—Address by Prof. J. Russell Reynolds, M.D., F.R.S., F.R.C.P.
11 a.m. to 1 p.m.—Papers and Discussions.
8 p.m.—*Conversazione* in the Town-hall.

Thursday, September 22.

Conference of Medical Officers of Health.
10·30 a.m.—Papers and Discussions on matters which come specially within the province of Medical Officers of Health.

Section II.—"Engineering and Architecture."
10.30 a.m.—Address by Prof. T. Hayter Lewis, F.S.A. F.R.I.B.A.
11 a.m. to 1 p.m.—Papers and Discussions.
2 to 5 p.m.—Ditto.
8 p.m.—Lecture to the Congress by Arthur Ransome, M.D., F.R.S.

Friday, September 23.

Section III.—"Chemistry, Meteorology, and Geology."
10·30 a.m.—Address by August Dupré, Ph.D., F.C.S., F.R.S.
11 a.m. to 1 p.m.—Papers and Discussions.
2 to 4 p.m.—Ditto.
5 p.m.—Closing General Meeting of Congress.

Saturday, September 24.

Excursions in the morning.
8 p.m.—Addresses to the Working Classes by Major Lamorock Flower; A. Wynter Blyth, M.R.C.S.; Henry Law, M.Inst.C.E.

IS A CONSERVATORY OR GREENHOUSE A BUILDING?

KNIGHTLEY *v.* COLLINS.

THIS question was once more determined in the affirmative. The District Surveyor for Hammersmith, Mr. Knightley, summoned Mr. Collins, of Cumberland Park, for erecting a large glass house, and omitting concrete foundations to the supporting walls. It seems that Mr. Collins had erected the house in question for his sons, who are florists, and contended that such structures were not buildings, but trade fixtures. The building in question is in the shape of the letter L, with a frontage towards the High-road of 27 ft., and a depth of 65 ft. The enclosing walls are of various heights, some 2 ft. 9 in., others 3 ft. 9 in., and some nearly 7 ft., with piers here and there 13 ft. above the surface of the ground.

Mr. Knightley presented a drawing of the structure, with a figure drawn by the side to serve as a scale of comparison, and called the attention of the Magistrate to section 6 of the Act of 1855, and contended that although in some cases it might be difficult to define what is a building, in this case that difficulty did not arise, as such structures as this were defined to be buildings, and as such partially exempted. He quoted the first part of sec. 6, and the 15th rule of the same section, and by-law No. 3, in support of his contention as to its being a building, and in justification of his demand for concrete.

Mr. Collins quoted the first rule of the first schedule, and contended he had complied with the law.

Mr. Knightley replied that the by-law directing concrete to be used, except the site be a natural bed of gravel, repealed the rule quoted by Mr. Collins. He also said that builders in his district could not plead ignorance of the law, as when the by-laws were first published by the Metropolitan Board of Works he had copies struck off, and when builders gave notice a copy was handed to them; he had distributed many hundreds, and Mr. Collins had had his copy. When the trenches were dug, Mr. Collins complained of being asked to use concrete. Mr. Knightley advised him to apply to the Board, who had relaxing powers, but he refused. Mr. Knightley then said, Mr. Collins, you must put in the concrete, but he refused that also; but when the decision was given against him, he then said he should apply to the Board. Mr. Knightley said he objected, as he was out of court by the effluxion of time, and asked for an order in the terms of the summons, which Mr. Bennett, the magistrate, granted.

ARCHITECTS' PLANS DETAINED.

CLARKE *v.* COUSINS.

UPON the application last Monday, at Bow-street, of Mr. Luke, counsel for the complainant, an architect, at 3, Gordon-square, Mr. Bridge, after some discussion of the point of law, decided that an architect's plans of buildings about to be erected in South wark are not "papers relating to land" within the exception mentioned in 2 and 3 Vict., cap. 37, sec. 40, and accordingly ordered the defendant, a builder, who had detained the plans, to deliver them up (or pay 14*l.*, their value), and 3*l.* 3s. costs.

"DUTIES OF A CLERK OF WORKS."

SIR,—Having had my money's worth in "Leaning's Quantities," I bought lately and have been reading Mr. Leaning's last little (very little,—equal to about three leaves of the *Builder*) and dear (very dear) book, "The Duties of a Clerk of Works."

The following items and extracts appear to me to require some further explanation from the author, if he will kindly so far favour us; or perhaps comment from yourself and your readers might be useful:—

P. 25, *Lime Mortar.*—"Have it mixed in quantities sufficient only for daily use." It used to be "mixed fresh and used *hot*" in the specifications of my youth, but now most people more wisely prefer a large quantity of mortar to be made up, well heaped or covered, *cooled* as long as possible, rebeaten, and used stiff. The boasted Roman mortar was not made from day to day as required, and used sloppy, as newly-made mortar must be.

P. 36, "Avoid use of selenitic lime for lathed work." I have heard the recommendation to avoid its use for the setting coat of ceilings, but have never heard that it is to be avoided for the laying or pricking-up coat and the floating coats. Indeed, it is specially recommended by some for these purposes.

P. 36, "If floors are not strongly timbered, the laying of the floor-boards will often break the key of plastering of ceilings, and many of them will fall; but there is less danger of this if there are no ceiling joists." Mr. Leaning does not surely mean what is printed, from which his readers might infer that there would be less danger to the ceiling below from the vibration caused by nailing the floor-boards above if the ceiling laths are nailed directly to undersides of floor joists, instead of to ceiling joists intervening between the plaster and the floor joists. At any rate, we have always been taught to the exact contrary.

P. 43, *Painter.*—"Do not allow too much oil and turps to be mixed with the colours" (no mention here of lead, only colours), "especially regard this for surfaces to be varnished." Most people know that varnish cannot be properly applied over a full oil coat. The coat immediately under the varnish should be a *flat* one, containing little or no oil.

P. 44, "See that varnish is not diluted by the addition of turpentine." Would not this take off its gloss, which might be required in some exceptional instances) Is not the usual method to dilute with oil, not turps?

P. 44, "Where work is varnished, special attention to sizing will produce best results." This requires the explanation that it applies only to unpainted work, or in some exceptional cases to old work painted or varnished, or both, when not re-painted or re-varnished. In new work, size between paint or varnish may save a coat of varnish, but is bad work. Is the idea to neutralise the oil in the undercoat of paint, which oil should not have been applied? ARCHITECT.

PROVINCIAL NEWS.

Chester-le-Street. — The extensive building works commenced by the Chester-le-Street Co-Operative Society two years ago are now on the point of completion. New shops, &c., for the following departments have been provided, viz.:—Drapery; boots, shoes, and hardware; tailoring, millinery, furnishings, butchering, and groceries; besides cocoa-room and restaurant, reading-room, library, and lavatories for ladies and gentlemen. Extensive stabling and cart-shed accommodation have been provided, together with cattle lairs and slaughter-house. Thirty-one cottages have also been erected, containing four and five rooms each, and the adjoining streets paved and sewered. The total cost has been about 14,000*l.*, excluding value of land. The work has been divided among various contractors, the principal being Messrs. J. Burnett & Son, of Birtley; Mr. Wm. Thompson, of Chester-le-Street; and Mr. John Yeeles, of Jarrow. The architects from whose plans and under whose superintendence the whole has been carried out are Messrs. S. Oswald & Son, of Newcastle-on-Tyne.

Chichester. — Major Hector Tulloch, Inspector for the Local Government Board, held an inquiry on Tuesday last respecting an application made by the Corporation of Chichester for sanction to borrow the sum of 2,250*l.* for the erection of an Infectious Diseases Hospital. The City Surveyor, Mr. Stringfellow, produced the plans, which, the Inspector stated, had received the approval of the Local Government Board. Considerable opposition was raised by members of the Ratepayers' Association and others as to the site selected by the Council, and alternative sites were suggested, which, however, did not appear to favourably impress the Inspector.

Heydon (*Norfolk*).—Colonel W. E. G. Lytton-Bulwer, J.P., of Heydon Hall, is erecting, in commemoration of Her Majesty's Jubilee, a canopy over the well on Heydon village green. The moulded jambs, arches, and buttresses are of special made brickwork, from the works of Mr. G. Gunton, of Costessey; the roof is covered with pressed Broseley tiles, and is surmounted at its apex by a cut and shaped terminal covered with lead. A panel bearing an inscription, and a seat, will be provided in one of the sides. Mr. George J. Skipper is the architect.

Street (*Somerset*).—The Jubilee Committee of Street decided to commemorate the fiftieth year of Her Majesty's reign by erecting a new vestry-room for the parish. Mr. George J. Skipper, architect, of Norwich, designed the building, and Mr. F. Huish, builder, has taken the contrast for carrying out the works. Provision is made on the first floor for the vestry-room, committee, and strong rooms; on the ground floor are the entrance, waiting-room, lavatory, and w.c.; also fire-brigade station, and stores, and hearse-house adjoining. A caretaker's house is attached to and communicating with the rest of the building. The whole is built of local Blue Lias Lime stone with Ham Hill stone dressings, and is of late Gothic style.

Competition for the New Government Buildings at Christiania. — Nearly one hundred applications have been received from architects for prospectuses and plans of the new Government buildings to be erected at Christiania, to which we recently referred.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

10,298, White Pigments. F. W. Lyte.

This invention relates to an improvement upon a process described in a previous specification, and has for its basis the use of soluble compounds of lead which are chemically combined with other lead bye-products so as to greatly increase the covering power of the paints made from it.

11,454, Kitchen Ranges. R. Hunter and John Turnbull.

This invention consists in providing in connexion with the fire-grate a movable bottom with improved devices for vertically raising or lowering and sustaining the same, so that the depth of the burning fuel may thereby be regulated, and a shallow fire be maintained in proximity to cooking utensils placed over it on the level of the hob by raising the movable bottom, and a deep fire, adapted for roasting and cooking in front of the grate, being obtained by lowering the bottom and filling up the grate with fuel. Suitable mechanism for raising and lowering the bars is fitted to each range for the above-mentioned purposes.

12,397, Fanlight and Casement Opener. H. Whiteley.

The opener for fanlights and casements, which is the subject of this invention, consists of a pivoted slotted bracket attached to the fixed frame of the casement or window. In the slot of this bracket is a runner attached to a bar or arm; at the other end of the bar or arm is formed a toothed quadrant, which is operated by a worm carried in suitable brackets and attached to the casement to be opened or shut. The worm is operated by a pulley and cord or chain. The action is as follows:—When the window is closed the bar lies close to the casement, clear of the window to be opened; on turning the worm one way it opens the casement by forcing out the end of the bar upon which the runner is carried, the runner passing along the pivoted bracket. By reversing the revolution of the worm the end of the bar carrying the runner is forced inwards, and the window is thereby closed.

12,401, Fastening Casements, &c. E. W. Taylor.

A rack or toothed bar with an automatic catch or clutch are the main features of this invention, which is described in minute detail in the specification.

12,526, Step-Ladders. R. Baird.

A step-ladder made in accordance with this patent is jointed or hinged in the middle; underneath the top step of the bottom or first half of the ladder are two sliding bolts, fastened together by a spiral spring, and shooting into sockets when the ladder is extended, so as to ensure its being rigid. When the ladder is to be used as steps the bolts are drawn inward, and the ladder then doubled; a quadrant keeps the two halves of the steps firm.

16,294, Sash-Fasteners. H. T. Bassett.

The object of the contrivance which is the subject of this patent is to prevent the window being forced by a knife or other instrument from the outside, and to draw the sashes closer together to prevent rattling. A screw is fixed so that when it is screwed up against the lever it cannot be moved nor the window opened.

9,246, Moistening Air and Ventilation. W. Thompson.

The improvements which are included in this patent refer to the use of special arrangements for injecting a jet or jets of water for ventilation and air-moistening purposes, applicable to the U-shape as well as to the flat cup-shaped ventilating apparatus. One strong jet is used, but is divided or disintegrated so as to ensure the full force of the spray. One cloud or sheet of water is formed by all the patterns of jets. This is afterwards broken up into spray, which moistens thoroughly the air passing near it.

NEW APPLICATIONS FOR PATENTS.

Aug. 26.—11,587, J. Holt, Latches and Bolts for Doors.—11,624, J. Hanna and T. Shillington, Stoves.

Aug. 27.—11,664, J. Munier and N. Salvaire, Colouring or Staining Wood.—11,671, G. and A. Needham, Window-fasteners.

Aug. 29.—11,684, J. Tomkys, Attaching Door Knobs to Spindles.—11,703, A. Rose and R. Hunter, Safety Fasteners for Window-sashes.—11,713, B. Russell, Radiators for Heating and Ventilating.

Aug. 30.—11,742, J. Honeyman, Drain Pipes.—11,744, T. Crook and W. Ormrod, Brickmaking Machines.—11,745, W. Ormrod, Self-lubricating Machines.—11,752, J. Mould for Brickmaking Machines. — 11,752, J. Goodman, Bricks for the better Fixing of Woodwork, &c.—11,772, S. Spencer, Window Fastening.

Aug. 31.—11,787, E. Bailey, Cupboard Turn.—11,829, W. Crozier, Locking Sash-fasteners.

Sept. 1.—11,833, R. Herrmann, WallPapers, &c.

PROVISIONAL SPECIFICATIONS ACCEPTED.

10,114, J. Wallas, Heads of Rainwater Pipes, &c.—10,481, S. Alley, and J. MacLellan, Water Meters.—10,446, C. Howe, Plaster of Paris.—10,562, W. Sargent, Water-waste Preventer for giving a

Flush and After-flush.—10,608, F. Hemming, Wood Veneers.—10,461, T. Bray, Syphon Water-waste Preventer Cistern for Water-closets.—10,704, C. Alger, Combined Door Fastener and Indicator.—10,858, J. Gill, Machinery for Making Pottery, Pressing Bricks, &c.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

11,121, H. Harris, Window Fastenings.—12,330, J. Tylor, Waste Preventing Cistern for Water-closets.—13,537, D. Lyon, Flushing Apparatus and Water-waste Preventer for Water-closet Cisterns.—17,119, P. Richards, Trapping Drains or Sewers.—5,280, C. Latter, Fixing Sheets and Roll Caps of Copper, &c., for Roofing Purposes.—8,621, J. Kretschmann and J. Goulson, Flushing Cisterns for Water-closets, &c.—9,800, A. Boult, Window Fasteners.—9,966, A. Earl, Door Bolts, &c.—13,597, J. Parsons, Fall Pipes and Fixing same.—13,692, W. Popplewell, Clamping Devices.—14,045, W. Granville, Electric Bells and Indicators.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

AUGUST 26.

By REYNOLDS & EASON.

Finsbury, Clifton-street—Ground-rent of 10*l.* 16s., reversion in 18 years	£550
Ground-rent of 6*l.* 16s., reversion in 27 years	320
Bloomsbury—26, Gloucester-street, freehold	1,400
Edgware-road—Ground-rents of 85*l.*, terms of 14 and 11 years	500

AUGUST 30.

By C. & H. WHITE.

South Lambeth—46, 48, and 50, Wilcox-road; and 1 to 4, little Spring-place, 35 years, ground-rent 20*l.* 10s.	600
Clapham-rise—13, 15, and 17, Fenwick-place; and a ground-rent of 16*l.* term 60 years, ground-rent 11*l.*	580

AUGUST 31.

By W. & F. HOUGHTON.

Old Ford—76, 78, and 80, St. Stephen's-road, with yards, stabling, and sheds in rear, freehold	850

SEPTEMBER 1.

By FOSTER & CRANFIELD.

Bromley-by-Bow—8 to 18, even, Cobden-street, 63 years, ground-rent 18*l.*	875

Miscellanea.

Remuneration to Architects for Competitive Designs.—Towards the close of the past year the following architects were invited by the trustees of the "Shannon Fund" to send in designs for a new Church of St. Kevin, at Kingsland Park, viz., Thomas Drew, R.H.A.; A. E. Murray, F.R.I.A.I.; J. F. Fuller, F.R.I.A.I.; J. R. Carroll, F.R.I.A.I.; and A. G. Jones. The fund being under the control of the Court of Chancery, a formal application was made to the Lord Chancellor (Ashbourne) to the effect that the unsuccessful competitors should be remunerated for their time and trouble in preparing drawings. His Lordship, in response, expressed his opinion that professional men should not be asked to give their time and experience without being fairly remunerated, and he accordingly made an order that the unsuccessful architects be paid fifteen guineas each out of the funds in court. As we have already stated, Mr. Drew took first place, and Mr. Murray second.—*Irish Builder.*

Douglas (Isle of Man).—The proprietors of the Twemlow's Yard Property have awarded the first premium of 35*l.* to Mr. Clarke, architect, of Liverpool, for the best scheme submitted for developing the property to the best advantage for building purposes. The second premium of 15*l.* has been awarded to Messrs. Stephen J. Holliday, architect, and H. Bertram Nichols, A.M.I.C.E., of Birmingham, joint authors of the plans placed second in order of merit.

The Standard Measure of Length in India.—A Reuter's telegram, dated Simla, September 1, says that the Government of India has under consideration legislation fixing the English yard as the standard measure of length for British India, and also legislation for the punishment of false trade descriptions, on the lines of the Bill promoted by the British Board of Trade regarding fraudulent marks on merchandise.

St. Edmund's Church, in Lombard-street, has been lately improved by the removal of the old stone steps in the chancel. These have been replaced by steps of white marble, and the floor has been relaid with black and white marble tiles. The work has been carried out by Messrs. Arthur Lee & Bros., of Bristol.

M. Chevreuil, the distinguished French *savant*, whose researches in connexion with colour are known to many of our readers, has just entered upon his one-hundred-and-second year.

Rapid Construction of a Chimney.—*Dingler's Journal* records the construction, in the short space of fifteen days, of a factory chimney in Belgium, 92 ft. high, 5 ft. 6 in. in diameter at the bottom, 3 ft. 6 in. at the top, on the system know as Max Ferbeck's. The mode of construction is described as follows:—At the bottom of a pit 21 ft. 6 in. deep, 18 ft. long, and 16 ft. 6 in. wide, a layer of concrete 1 ft. 4 in. deep, and consisting of equal parts of sand and cement, was spread out, and upon this bed fir beams 7 in. square were laid. Then followed another layer of cement 1 ft. 6 in. deep, but consisting of one-third cement and two-thirds sand. Upon this foundation the base of the chimney was constructed of ordinary bricks up to 6 ft. above the ground, after which the work was handed over to the contractor, M. Max Ferbeck, who completed the chimney in twelve days with a workman and a labourer. Four different shapes of hooklike radial bricks in five sizes were employed, the bricks locking into each other two ways with their hooks. The mortar used was partly ordinary mortar, partly mortar mixed with cement; the pointing was done with cement mortar. The shaft was constructed without outside scaffolding. The sides of the chimney have a thickness of only 13 in. at the bottom and not quite 7 in. at the top. The total weight of the brickwork is estimated at 60 tons, and the total cost was 93*l.*, of which 27*l.* was for freight and duty). It may be doubted whether the employment of a chimney base of the nature described, the use of different kinds of mortar setting at various degrees of quickness, and the rapid method of construction are to be recommended in building high factory chimneys.

Sale of Properties.—By direction of Lord Rodney will be put up for auction, on the 14th instant, at Hereford, the property known as Berrington, near to Leominster. The Hall is a fine mansion, built of stone lined with brick, in the Italian style, and stands in a park of about 350 acres. The rest of the estate, corresponding to what is known as the "Home of the Herefords," includes some twenty-two farms, about 4,300 acres of land in all. The rental value is estimated at nearly 6,500*l.* per annum. On a later date will be offered also the two Yorkshire (North] Riding) properties of Hilton Manor and the Hall, Sutton-on-the-Forest. The latter, consisting of a good old red brick house, and 3,600 acres of land, valued at 4,100*l.* a year, is of interest as associated with the memory of Sterne, who was for a while vicar of the parish. The parish, situated eight miles north from York, lies within the ancient Galtres forest. Hilton, between Yarm and Stokesley, is a former residence of the Earl of Burlington and the Duke of Devonshire. The estate, watered by the Leven, comprises the whole parish of 1,360 acres, and yields a rental of 2,000*l.* a year. The advowson of the living, worth 140*l.* per annum, goes with the freehold.

A New Building Estate at Lowestoft.—A property designated the Kirkley Cliff Estate, at South Lowestoft, has recently been laid out for building upon, and last week the first portion of the property, containing fifty-six sites, was offered for sale in a marquee erected on the estate by Mr. A. G. Notley. Several of the plots submitted, having frontages to the sea of 20 ft., and depths of 135 ft., were sold at from 60*l.* to 70*l.* each, two corner plots of larger dimensions being sold for 150*l.* and 80*l.* each. The sale also included several marine residences, and a number of shops and dwelling-houses erected on the estate by Messrs. Lucas Bros., of London. The marine residences, seven in number, on Cliff-terrace, facing the sea, said to be let at rentals of 75*l.* and 80*l.* per annum, were sold for 1,500*l.* each, two other villas realising 800*l.* and 500*l.* respectively. Eight residences, designated Kirkley Cottages, were sold at prices varying from 300*l.* to 860*l.* each, whilst fifteen shops and dwelling-houses realised 420*l.* and 450*l.* each. The total proceeds of the sale amounted to upwards of 19,000*l.*

New Museum at Brussels.—The city of Brussels has acquired a new museum building by the reconstruction of the handsome Maison du Roi, on the Grande Place. The museum contains a vastly valuable collection of civic paintings and other *objets d'art* of the same nature, acquired by the city from time to time.

The Increasing Use of Cement in Germany.—The *Sprechsaal* remarks that scarcely any German industry has made such progress within the last twenty years as the manufacture of Portland cement. Not only have cement tests and kindred topics been discussed in trade journals from all points of view, but each factory has been trying to increase its out-put. With increased production comes the necessity for an extended sale, and thus attempts have been made to use cement for the entire construction of work in which it normally is only used as a binding agent. It is, however, urged that no substances are more liable to be affected by atmospheric influences than cement and cement concrete; and, moreover, that no other building materials are more dependent upon the conscientiousness of the contractor, sand and small stones being cheap and cement dear. About the end of 1885 the Prussian Government issued regulations enjoining as restricted use as possible of cement for elevated building purposes. This measure seems, however, to have had but little practical result. While defects in ordinary masonry can be seen during the period of construction or before the completion of a building, such is not the case with cement work. A single cask of insufficiently binding cement may bring about the destruction of an important structure, various instances being adduced in support of these assertions. The most serious point in connexion with this question is considered to be the use of cement concrete for purposes of drainage, special danger arising from the destructive acids and alkaline influences to which such work is necessarily subjected. The favourable reports which have from time to time been circulated as to the satisfactory results obtained in such cases by the use of cement are considered by the *Sprechsaal* to demand a searching investigation, it being considered that the work is, in many cases, too new to allow of its merits being decided upon the basis of present experience. This article has given room to some interesting controversy in German technical circles, the importance of the interests ranged on each side of the question giving a practical form to the discussion.

Protection of Theatres from Fire.—Since the burning of the Opéra Comique, French and German technical journals have been largely discussing the best means to be adopted for preventing the spread of fire in theatres, and some of the suggestions set forth may be of interest and value in view of the terrible catastrophe at Exeter. Thus most of the French journals advocate the compulsory introduction of electric light in theatres, and that the scenery, &c., be made of fireproof materials, whilst one, the well-known *Génie Civil*, recommends the adoption of flock silk instead of canvas for the scenery. This material, the journals says, is somewhat more expensive than canvas, but possesses in return the advantage of being more durable and burning slower, almost like tinder. It further states that the Theatrical Committee appointed in Paris after the Opéra Comique catastrophe applied to a Dr. Gehring, an engineer, and mayor of Landshut, inviting him to furnish particulars of the theatrical scenery invented by him and patented some years ago. Dr. Gehring's scenery is made of metallic and semi-metallic wire netting, which may be painted on with the same facility as canvas, whilst being incombustible. Even under the greatest heat the material only glows and becomes charred. The Committee has since decided upon recommending the material for the scenery at the new Opéra Comique. The journal further draws attention to the automatic extinguishing apparatus adopted in certain American theatres, consisting of a great cistern of water, from the bottom of which pipes run in various directions. The latter are closed at the other end by means of a composition consisting of lead, tin, and bismuth, which melts at a temperature of 75°C., whereby water is immediately poured down in torrents on the place on fire. At the same time an automatic alarum bell warns the attendants of the danger threatening.

M. Hugo Birger.—The death is announced, at the early age of thirty-seven, of the celebrated Swedish painter, M. Hugo Birger. Having studied at the Academy of Arts in Stockholm, he gained, in 1877, the Royal Gold Medal for his painting, "The Fall of Adam." Since then Birger studied in France and Spain, where he produced a number of works, which realised large sums in his native country.

Hygienic Investigation in Stockholm. One of the last reports of the Hygienic Board of the city of Stockholm contains a paper by Herr K. Sonden on a series of researches carried out last year on the purity and temperature of the air in a number of public buildings in that city, particularly where the electric light has superseded gas, which are highly interesting. In all twenty buildings were visited,—some two, three, or four times,—the method adopted in the research being the so-called Pettenkorff, a method whereby the purity of the air is determined by the amount of carbonic acid it contains. Beginning with the theatres, we find that in the Royal Grand Theatre, on the electric light being partially introduced instead of gas, there was a great improvement of the air both as regards purity and temperature, although the improvement was not so complete as in other theatres examined, as, for instance, the Court Theatre of Munich, where the electric light has entirely superseded gas. In the Dramatic Theatre, too, great improvement appears manifest since the gas-burners in the building were reconstructed so as to promote ventilation instead of, as before, increasing the volume of carbonic acid and raise the temperature. Thus, whilst four years ago, five per cent. of carbonic acid was not unusual with a temperature of about 30° C., the greatest amount noted last year was only 2·6 per cent., and the highest temperature 24° C. In the New Theatre, on the other hand, where a similar system of gas-lighting has also been introduced, and where, moreover, there is an air-fan, no improvement of the air has been effected, a result which the analysts cannot as yet explain, although they ascribe it to a bad circulation of air. However, of all the Stockholm theatres, the so-called Southern Theatre was found the worst, the amount of carbonic acid in the air on the second tier rising sometimes to six pro mille, and the temperature to 30° C. This theatre is, however, situated in a part of Stockholm where the hygienic arrangements are very inferior. Turning to the churches and lecture-room, we find that in one of the former, during a meeting of the Salvation Army, the amount of carbonic acid rose to 6·22 per cent. In another church during evening service, the carbonic acid rose to 5·41 per cent., with a temperature of 24·8° C. In the Klara Church, the principal church in Stockholm, an analysis was made when the church was crowded, showing that whilst the temperature only varied from 16·3° at the beginning of the service to 19·5° at the end, the amount of carbonic acid rose from 1·75 to 57 per cent. Of other buildings examined may be mentioned one at the lecture-hall in a public college, where the amount of carbonic acid in the air at the close of the lecture was 2 per cent., and one of the superior courts, where it was 6·25 per cent. The researches in factories, &c., embraced three snuff and tobacco manufactories, and seven printing-offices, and in the former the air was naturally greatly mixed with tobacco dust, whilst in one snuff factory every cubic mètre of air contained half a gramme of fine snuff. In another tobacco manufactory, where the electric light had everywhere superseded gas, the amount of carbonic acid in the so-called rolling-room was, nevertheless, from 4 to 5·3 per cent. In some of the printing-offices the air was very bad, in one containing over 5·41 per cent., but in another, that of the *Stockholm Daily Journal*, it was only 0·5 per cent., viz., almost pure. It was found that where good ventilators had been introduced the improvement of the air was very marked. It is intended to continue these researches, as the Hygienic Board is of opinion that they will greatly tend to improve the sanitary condition of buildings where large numbers of people are occupied.

Codnor Sewerage.—A meeting of the ratepayers of this Derbyshire district was held on the 5th, to consider a scheme of sewerage submitted by Mr. W. H. Radford, C.E., of Nottingham, as an alternative to one previously drawn out by the Surveyor to the Basford Guardians, who are the Authority in the district. The ratepayers approved Mr. Radford's scheme as the cheapest and most efficient in their opinion: cost of works, 3,900*l*. The Basford Guardians, last Tuesday decided to send the two schemes to the Local Government Board, accompanied by an intimation that the local vestry preferred Mr. Radford's, and asking them to choose the best scheme.

The Russian Portland Cement Trade.—An article in the *Journal du Céramiste et du Chaufournier* quotes a statement of the French Consul at Moscow that English, German, and Swedish cements are imported in relatively large quantities into Northern and Central Russia. Stettin cement is in special demand, and the Swedish mark, "three crowns," from Lomna, in the province of Skanske, is largely sold. English Portland cement sells at a price about equal to 3s. 1d. to 3s. 4d. per cwt. gross; the duty forming about a quarter of the price (10½d. per cwt.). German and Swedish cements range from 3 per cent. to 5 per cent. below the price of the English article. Russian cement is considered superior to English in quality, Government contracts stipulating its exclusive use. The principal markets for the sale of imported cement are St. Petersburg and Riga. Importation at the latter point has, however, sensibly diminished. At Moscow, the consumption of foreign cement is limited, on account of the competition of factories situated in the industrial district of the city. Amongst the principal Russian factories are the following:—

	Annual production. Barrels.
1. Company succeeding C. C. Schmidt, Riga...	120,000
2. Cement Company, Podolsk	80,000
3. Cement Company, Port Kund, Vesenberg...	55,000
4. E. Liphardt & Co., Moscow (Works at Tzurora)	20,000
5. Stanislas Cjechanorsky, Grodzetz (Poland)	50,000

By the Customs returns it would seem that the total imports in 1885 were 46,814 tons, against 53,289 tons in the preceding year.

Extensive Building Operations in Hamburg.—It is now four years ago, says a Hamburg journal, since the extensive building operations necessitated by this city joining the German Customs Bund were commenced, when, in order to provide sufficient space for the free trade harbour on one side and the duty dock on the other, some 20,000 inhabitants had to quit their dwellings. This great revolution took place in the old part of the town. From the returns now furnished for the four years to the end of 1886, it appears that a sum of 5,300,000*l*. has been expended in this undertaking, of which the German Empire pays 2,000,000*l*., extended over five years. Of the above-mentioned sum 3,350,000*l*. have been expended in erecting new buildings, and 200,000*l*. as interest on loans, making a total of 3,550,000*l*. The greatest outlay appears to have been in purchase of ground, under which item a sum of 2,000,000*l*. was expended on the Hamburg side of the Elbe alone. On the other hand, it may be mentioned that the "golden times" anticipated four years ago by our building speculators, artisans, and workmen have failed to put in an appearance, a circumstance which may be ascribed to the severe competition offered from beyond the city, the great influx of workmen from Silesia, Poland, and even Italy,—the latter working for a minimum of wages, though being excellent and reliable workmen,—and the means of transport becoming every day easier, which have the effect of lowering the price of labour as well as material. A large number of houses have been sold below their cost. For excavations and foundation work almost only foreign labourers were employed, chiefly Italians, their Hamburg *confrères* showing a decided objection to hard work.

Folding Steel Gates and Shutters.—These, which are patented by the "Bostwick Folding Steel Gate and Shutter Co.," consist of steel shutters with the vertical bars connected by two or three series of short bars arranged trellis-wise, working on centres at the point where they intersect each other and the vertical bar, but with the ends of the cross pieces working loose in channels in the vertical bars. By this arrangement it is possible to push the whole of the vertical bars close up together, into a space of a few inches, and if necessary the whole, when closed up, can be further turned round on a hinge and lie against the window or door jamb, like an ordinary shutter. Among the advantages are security combined with ventilation, as the shutter can be drawn out and locked across a door or window without obstructing air or much light. The straight backwards and forwards motion in one plane, in closing up or pulling out the shutter, is a convenience, as the shutter does not interfere with curtains or blinds in process of being closed. The invention seems likely to be a useful one.

Malthouse, Cardiff.—A large malthouse is now being completed for the Cardiff Malting Company, on the East Moors, Cardiff. It contains four growing-floors, 110 ft. long by 50 ft. wide, and two double-floor kilns, 35 ft. by 31 ft. The building is designed to work on the improved system introduced by Mr. H. Stopes, the well-known maltsters' engineer, of London. The ground, first, second, and third floors, are to be used as growing floors, the fourth floor as a barley-loft, and the roof as a malt-store, containing 30,000 cubic feet of storage space, besides a 10-ft. wide gangway running down the middle, the bays at each end being used for screening-loft, store-tank, &c. In the barley-loft is placed a 6 h.-p. Griffin's patent gas engine, and the shafting for driving a band-conveyer in the roof, elevators, and sack-hoists. Four of Free's patent conical-bottomed steeping cisterns are also in this loft, and between each pair is a small elevator for raising barley into the loft above, whence it passes over screens into the steeping-tanks. Under these tanks are trap-doors in all the floors, whereby the steeped grain can be let out to grow on any floor at the maltster's pleasure. The lowest floor of the kilns contains the furnaces, coal-store, &c.; also an office for the manager, a mess-room for the men, lavatories, &c. The floor above is a malt-store, containing 15,000 cubic feet of storage space, and over this again is the top of the furnace shaft, and hot-air dispersing chamber. Above this, and level with the top growing floor, is the lower drying floor, of Fison's perforated tiles; and level with the barley loft is the upper drying floor, of Hermann's patent wedge-shaped wire. No cowls are fixed on the outlets above, which are left open, except for pyramidal roofs supported on posts, to keep the rain from entering the kilns. The upper kiln floors are loaded by an elevator, and emptied by openings communicating with the lower kiln-floors. Thence the malt can either be passed through spouts into the malt-store beneath, or raised by another elevator to the band-conveyor in the roof, by which it can be delivered over screens into the bins. The building is very substantially erected in brickwork, faced with red Pencoed bricks. The floors throughout are of concrete, supported on rolled iron joists and cast-iron stanchions. The roof is arranged with a special view to storing malt, and is lined inside and out with boarding. Upon the outer boarding is laid tarred felt, and upon that the battens and slates. The steeping-tanks are supplied and fixed by Messrs. Goddard & Massey, of Nottingham; the kiln-floors by Messrs. Stopes & Co., of London; the machinery and gas-engine by Messrs. Spencer & Co., of Melksham; the architect's advising engineer being Mr. J. Gillett, of Penarth; the gas and water services by Messrs. Cross Bros., of Catdiff; the iron construction by Messrs. Williams & Sons, of Cardiff, under the general contractors, Messrs. Shepherd & Son, of Cardiff. The architect is Mr. F. Baldwin, 17, Church-street, Cardiff; and the clerk of work's duties have been very officiently discharged by Mr. David Owen.

Discovery of Sculpture by Thorwaldsen. During the recent repairing of a house at Neuerwall (in Hamburg), one of the most important business quarters of the town, two original works of art by Thorwaldsen have been discovered. The former owner of the house, Herr Hartzen, a dealer in artistic objects, was a friend of the famous Danish sculptor, and when the former, after the destruction of Hamburg by fire some forty years ago, rebuilt his house, Thorwaldsen presented him with four *hauts reliefs*, representing the arts of painting, sculpture, architecture, and music, for the purpose of ornamenting the front of the building. Time and weather have, however, destroyed the two former, but the discovery of the latter has saved them from destruction, their restoration having now been taken in hand. There cannot, from the facts stated, be the slightest doubt as to the genuineness of these works of art.—*Hamburger Nachrichten.*

Extension of the Metropolitan Railway. A further extension of the Metropolitan Railway was opened on the 1st inst. from Pinner to Kingswood and Rickmansworth for passenger traffic. The line is in course of construction to St. Albans, Aylesbury, Oxford, &c. The company intend, it is said (in the daily papers), to extend their system as far as Birmingham. Can this possibly be true? If so, the company will require re-naming.

Strike of Joiners at Elswick.—On the 1st inst. about 200 joiners employed at the Elswick Shipyard of Messrs. Armstrong, Mitchell, & Co., came out on strike in consequence of a dispute as to the carpentering and joining work, the carpenters receiving 2s. a week more than the joiners.

"New Premises in the Haymarket."—With reference to these premises, described and illustrated in our last, we are asked to mention that all the stoves,—chimney-pieces in marble and American walnut, as also the tile-hearths, &c.,—were supplied by Mr. N. Maurice, of Braemar-road, Tottenham.

Exhibition of Painting and Sculpture at Brussels.—On the 1st inst. the king, accompanied by the Count of Flanders and Prince Baudouin, opened an exhibition of painting and sculpture in the galleries formerly occupied by old pictures. It will remain open until Nov. 1.

PRICES CURRENT OF MATERIALS.

TIMBER.	£. s. d.	£. s. d.
Greenheart, B.G. ....ton	5 10 0	7 10 0
Teak, E.I. ....load	8 10 0	13 0 0
Sequoia, U.S. ....foot cube	0 2 3	0 3 0
Ash, Canada ....load	3 0 0	4 10 0
Birch ,, ...	2 0 0	3 10 0
Elm ,, ...	3 10 0	4 10 0
Fir, Dantsic, &c.	1 10 0	4 0 0
Oak ,, ...	2 10 0	4 10 0
Canada	3 0 0	6 0 0
Pine, Canada red	2 0 0	3 10 0
,, yellow	2 0 0	4 0 0
Lath, Dantsic ....fathom	3 0 0	5 0 0
St. Petersburg	4 0 0	5 10 0
Wainscot, Riga ....log	0 0 0	0 0 0
,, Odessa, crown....	2 10 0	3 0 0
Deals, Finland, 2nd and 1st...std.	7 0 0	8 0 0
,, 4th and 3rd	5 10 0	6 10 0
Riga	5 10 0	7 0 0
St. Petersburg, 1st yellow	8 0 0	13 0 0
,, 2nd ,, ...	7 0 0	8 0 0
,, white	6 10 0	8 10 0
Swedish	0 0 0	0 0 0
White Sea	0 0 0	0 0 0
Canada, Pine, 1st	16 0 0	24 0 0
,, ,, 2nd....	10 0 0	15 0 0
,, ,, 3rd, &c....	6 0 0	9 0 0
,, Spruce, 1st	8 0 0	9 0 0
,, ,, 3rd and 2nd....	5 0 0	7 0 0

TIMBER (*continued*).	£. s. d.	£. s. d.
New Brunswick, &c....	5 0 0	6 10 0
Battens, all kinds	4 0 0	10 10 0
Flooring Boards, sq., 1 in., prepared, First	0 8 0	0 11 0
Second	0 6 6	0 7 6
Other qualities	0 4 0	0 6 0
Cedar, Cuba ....foot	0 0 3½	0 0 3¾
Honduras, &c.	0 0 3	0 0 3¼
Australian	0 0 2	0 0 3
Mahogany, Cuba	0 0 4	0 0 6
St. Domingo, cargo average	0 0 4	0 0 5½
Mexican ,, ...	0 0 3½	0 0 3¾
Tobasco ,, ...	0 0 3½	0 0 5
Honduras ,, ...	0 0 3½	0 0 5
Maple, Bird's-eye	0 0 5	0 0 7
Rose, Rio ....ton	8 0 0	11 0 0
Bahia....	7 0 0	9 0 0
Box, Turkey ....ton	5 0 0	12 0 0
Satin, St. Domingo ....foot	0 0 5	0 0 9
Porto Rico	0 0 6	0 0 10
Walnut, Italian	0 0 3½	0 0 5½
METALS.		
IRON—Bar, Welsh, in London...ton	4 7 6	4 15 0
,, ,, in Wales	4 2 6	4 7 6
,, Staffordshire, London	5 10 0	6 0 0
COPPER—		
British, cake and ingot ....ton	43 10 0	44 0 0
Best selected	44 10 0	45 10 0
Sheets, strong....	50 0 0	0 0 0
Chili, bars	40 0 0	40 10 0
LEAD—		
Pig, Spanish ....ton	12 1 3	0 0 0
English, common brands....	12 5 0	12 7 6
Sheet, English	13 6 3	0 0 0
SPELTRE—		
Silesian, special ....ton	15 0 0	15 2 6
Ordinary brands....	14 17 6	0 0 0
TIN—		
Straits....ton	102 10 0	0 0 0
Australian	103 5 0	0 0 0
English ingots	106 10 0	0 0 0
OILS.		
Linseed ....ton	20 10 0	20 15 0
Cocoanut, Cochin	30 0 0	33 0 0
Ceylon	23 15 0	24 0 0
Palm, Lagos	22 10 0	0 0 0
Rapeseed, English pale	24 0 0	24 5 0
,, brown	22 15 0	0 0 0
Cottonseed, refined	20 15 0	21 0 0
Tallow and Oleine....	25 0 0	45 0 0
Lubricating, U.S.	5 0 0	6 0 0
,, refined....	5 0 0	12 0 0
TURPENTINE—		
American, in casks ....cwt.	1 5 3	0 0 0
TAR—		
Stockholm ....barrel	0 14 0	0 14 6
Archangel	0 9 6	0 9 9

CONTRACTS AND PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Road Materials	Bromley Local Board...	*Official*	Sept. 13th	x.
Broken Granite and Granite Curb	Rast Ham Local Board	W. H. Savage	do.	ii.
Taking-down and Rebuilding Bridge	Kent Justices	F. W. Ruck....	Sept. 14th	ii.
Road Materials	S. Hornsey Local Board	E. Fry	do.	x.
Removal of Dust and House Refuse....	do.	do.	do.	x.
Erection of Station Buildings, Gospel Oak ...	Midland Railway Co. ...	A. A. Langley	Sept. 15th	x.
Sanitary Shed, &c.	Leicester Corporation	J. Gordon	do.	ii.
Erection of Manufactory, Stratford....	Finchley Local Board...	E. Monson, Jun.	Sept. 16th	x.
House-Drain Connexions	The Imperial Institute	G. W. Brumell....	Sept. 19th	x.
Foundations of Proposed Buildings....	Burnham Local Board	T. E. Colcutt....	do.	x.
Sewage Works	Lewisham Bd. of Wks.	J. H. Palmer....	Sept. 20th	ii.
Kerbing, Metalling, and Channelling Works	Fulham Vestry....	*Official*....	do.	ii.
Road-making and Paving Works	Hendon Local Board ...	do.	Sept. 21st	x.
Sewering and Making-up Roads, &c.	Morley Corporation ...	S. S. Grimley	Sept. 23rd	x.
Water Fittings	Great Western Ry. Co.	*Official*	Sept. 26th	x.
Stores and Materials	Met. Board of Works...	do.	October 3rd	x.
Cleaning, &c., Margin of Pond, Peckham	....	do.	October 4th	ii.
Houses and Shops, Homerton		R. Stapleton	Not stated...	x.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page
Assistant Surveyor of Buildings	Civil Service Com.	Not stated	Sept. 27th	xiv.
Draughtsman and Assistant Surveyors	do.	do.	do.	xiv.

TENDERS

ACTON.—For the erection of the first portion of the proposed Church of St. Alban the Martyr, Acton Green, London, Mr. Edward Monson, jun., A.R.I.B.A., architect, Acton:—

J. Dorey, Brentford (accepted)	£3,530 0 0

ACTON.—For the erection of five cottages in Montgomery-road, Acton Green, London. Mr. Edward Monson, jun., A.R.I.B.A., architect, Acton:—

Geo. Thomas, Acton Green (accepted)....	£1,075 0 0

BEDDINGTON.—For proposed alterations and repairs at Brandries Hill House, Beddington. Mr. C. Innes, architect, 27, Queen-street, City:—

Prestige & Co., Pimlico	£3,819 0 0
Dawson & Son, Beddington	3,818 0 0
Maides & Harper, Croydon	3,753 0 0
J. Smith & Sons, South Norwood ...	3,597 0 0
Macey & Sons, Strand	3,327 0 0
T. J. Messom, Twickenham	3,195 0 0

BARNET.—For coach-house and stable, for Mr. A. Emms. Mr. E. B. Julian, architect:—

Gray	
Royer	£165 0 0
Marriott Bros. (accepted)	165 0 0
	140 0 0

BARNET.—For alterations at Lyonsdown, Barnet. Mr. A. Allen, architect:—

Dainton	£1,965 0 0
Ellwood	1,798 0 0
Wilkins	1,565 0 0
Marriott Bros.	1,560 0 0
Ansell	1,555 0 0
Mattock	1,491 0 0
Noble	1,472 0 0
Harris	1,227 0 0
Richardson	1,221 0 0

BERMONDSEY.—For the erection of new shop on forecourt, and sundry alterations and repairs to house and shop, No. 234, Southwark Park-road, for Mr. Jacks. Mr. Edward Crosse, architect, 32, Bermondsey-square:—

A. White & Co., Rotherhithe	£195 0 0
J. Almond, Bermondsey	185 0 0
G. Smithers, Bermondsey (accepted)	180 0 0

BERMONDSEY.—For rebuilding two back additions and underpinning walls and piers, and new water supplies, to Nos. 46 and 48, Camilla-road, for Mr. H. Hankin. Mr. Edward Crosse, architect:—

A. White & Co., Rotherhithe	£196 0 0
G. Smithers, Bermondsey....	187 0 0
J. Almond, Bermondsey (accepted) ...	185 10 0

BLACKHEATH.—For alterations and decorations at St. John's Church, Blackheath, Kent. Messrs. Drury & Lovejoy, architects, Bucklersbury:—

H. L. Holloway	£598 0 0
G. F. Havell	530 0 0
Smith & Son (accepted)	474 0 0

BROMLEY (Kent).—For alterations and additions at 147, and 148, High-street, Bromley, for Mr. George Pyrke. Mr. G. S. W. Tappen, architect. Quantities by Messrs. Duffield & Player, High-street, Bromley, Kent:—

J. Crossley....	£740 0 0
Arnaud	677 0 0
D. Payne	676 0 0
J. Maddington, Sydenham	619 0 0
W. A. Grubb (accepted)	575 0 0

[All of Bromley.]

BROOKE (I.W.).—For making a new road at Brooke, I.W., for the Royal National Lifeboat Institution. Mr. J. E. Haynes, surveyor:—

J. Kingswill (accepted)....	£135 0 0

BROOKE (I.W.).—For making a new road, at Brooke-corner, I.W., for the Highway Commissioners. Mr. J. E. Haynes, surveyor:—

F. Coker....	£135 0 0
J. Kingswill (accepted)	122 0 0

CHELSEA.—For works at 269, King's-road, for Mr. Lockyer. Mr. H. W. Budd, architect, 76, Vincent-square:—

Alterations.

Prestige & Co. (accepted)	£95 0 0

Shop Fittings, &c.

Sage & Co. (accepted)	180 0 0

CHELSEA.—For the erection of business premises, warehouses, and stabling, at King's-road, Chelsea, for Mr. Chas. Knowles. Mr. W. H. Collbran, architect, 94, Gloucester-road, South Kensington. Quantities by Mr. E. Parker:—

Higgs & Hill	£6,444 0 0
Martin Wells & Co.	6,062 0 0
Hy. Smith & Son	5,997 0 0
Holliday & Greenwood	5,887 0 0
Stimpson & Son....	5,685 0 0
Holloway Bros....	5,624 0 0
Hearn & Co.	5,563 0 0
Lorden & Son....	5,495 0 0
Green & Lee	5,385 0 0
Chas. Wall....	5,349 0 0

CHERTSEY (Surrey).—For repairs to Cowley Farm and Estate.—

G. Marsh, Woking	£162 3 0
C. Fifield	147 15 0
H. Brown, Addlestone	142 0 0
H. G. Nesmyth, Chertsey (accepted)...	140 0 0

CLERKENWELL.—For Conservative club premises and Hall, Penton-street, Clerkenwell. Mr. H. C. Leete, surveyor. Quantities supplied:—

E. C. Howell & Son	£3,762 0 0
G. Stephenson	3,733 0 0
C. P. Mills....	3,657 0 0
F. R. Turtle	3,599 0 0
W. & H. Castle....	3,440 0 0
A. G. Allard	3,400 0 0
W. L. Kellaway, Clerkenwell	3,288 0 0
J. Beale, Westminster	3,212 0 0

DEPTFORD.—For alterations and additions to Deptford Lower-road Schools, for the School Board for London. Mr. Thos. J. Bailey, architect:—

W. Smith	£4,274 0 0
C. F. Kearley....	4,260 0 0
B. E. Nightingale....	4,197 0 0
J. & J. Greenwood	4,160 0 0
W. Downes....	4,133 0 0
C. Cox	3,958 0 0
Kirk & Randall....	3,943 0 0
W. Johnson	3,803 0 0
Stimpson & Co....	3,770 0 0
Atherton & Latta	3,695 0 0
H. L. Holloway....	3,619 0 0

ENFIELD.—For alterations and additions to the Pied Bull public-house, Bull's Cross, for Mr. G. Gripper. Messrs. Searle, Halton, & Bowyer, architects, Tottenham:—

	Additions to House.	Repairs to Old part.	New Stables.
Patman, Enfield	£409	£110	£260
Porter, Tottenham ...	395	87	227
Lawrence, Waltham	325	88	181

FOREST GATE.—For the erection of three shops, with dwellings, situate on premises adjoining the Princess Alice public-house, Romford-road, for Mr. Charles J. Knowles. Mr. James F. Wesley, architect. Quantities by the architect:—

J. & J. Greenwood	£4,100 0 0
W. Shurmur	3,867 0 0
W. Gregar	3,733 0 0
J. Morter	3,673 0 0
Harris & Wardrop	3,666 0 0
M. Gentry	3,550 0 0
W. Watson....	3,520 0 0

HAVERFORDWEST.—For the erection of additional class-rooms, dormitories, and other additions and alterations to the Haverfordwest Lloyd's Free Grammar School, for the Governors. Mr. D. Edward Thomas, architect, Haverfordwest. Quantities by the architect:—

Jenkins Bros., Swansea	£3,756 0 0
W. Summons, Hakin, Milford Haven	3,018 0 0
Codd & Davies, Haverfordwest	2,858 0 0
Joseph Lewis, Haverfordwest	2,463 0 0
Thos. Jenkins, Pelcomb, near Haverfordwest (accepted).....	2,241 0 0

KILBURN.—For completion of block of flats, Priory Park-road, for Mr. John Harris. Quantities supplied by the architect, Mr. Richard D. Hansom, High-road, Kilburn:—

William Smith	£2,995 0 0
Turtle & Appleton	2,825 0 0
Macey & Sons....	2,375 0 0
G. Neal	2,275 0 0
H. Beckett....	2,151 0 0
J. M. Goodwin	2,110 10 0
Carlin	2,094 0 0

LEE (Kent).—For the erection of a villa residence at Lee-road, Lee, for Mr. W. E. Hill. Mr. A. H. Kersey, architect. Quantities supplied:—

Holliday & Greenwood	£1,729 0 0
H. L. Holloway	1,724 0 0
Delby	1,710 0 0
Burman & Son	1,654 0 0
F. & F. H. Higgs	1,517 0 0
Castle	1,402 0 0

LEICESTER.—For new streets and sewers on the Westcotes Estate, Narborough-road, for the Rev. Joseph Harris. Messrs. W. Millican & H. Gibson, surveyors:—

Jones & Fitzmaurice, Birmingham	£1,620 17 5
E. T. Hutchinson, Leicester	1,524 0 0
J. Lea, Ratby	1,416 0 0
J. Smith, Belgrave	1,349 16 2
W. Cordon, Nottingham	1,324 16 0
B. W. Ward, Whetstone	1,299 12 11
J. D. Gibbins, Leicester	1,274 10 0
S. & E. Bentley, Leicester	1,226 0 0

LONDON.—For alterations and repairs, painting, &c., to the Pitt's Head public-house, corner of Old-street, E.C., for Mr. J. Jay. Mr. Joseph G. Needham, architect, No. 11, Powerscroft-road, Lower Clapton, N.:—

King	£290 0 0
Harrison & Co.	254 10 0
J. Walker	247 18 0
S. W. Hawkings	242 0 0
J. Long	240 0 0
Watson	227 17 7
Gasfittings.	
J. Ungar & Co.	33 10 0

LONDON.—For the erection of a new club-house at Settle-street, Commercial-road, for the Rev. Harry Wilson, M.A. Mr. Henry Wilson, architect. Quantities by Mr. Thornicraft:—

Dove Bros.	£1,045 0 0
E. Laurence	981 0 0
H. L. Holloway (accepted)	969 0 0

LONDON.—For alterations and repairs to the Old Cock Tavern, Highbury, for Mr. Richard Baker. Quantities by the architect, Mr. Arthur W. Saville, 99, Strand:—

Drew & Cadman	£2,865 0 0
G. H. & A. Bywaters	2,807 0 0
G. S. Williams & Son	2,720 0 0
W. Oldrey & Co.	2,650 0 0
Ward & Lamble	2,541 0 0
J. T. Chappell	2,476 0 0
Spencer & Co.	2,375 0 0
Pewterer's Fittings.	
Watts & Co.	284 0 0
Helling	245 0 0
Heath	217 0 0

LONDON.—For rebuilding the Goldsmiths' Arms, Bartholomew-close. Mr. H. W. Budd, architect, 76, Vincent-square:—

Bush (accepted)	£1,900 0 0
Pewterer, &c.	
Moody (accepted)	187 10 0
Gas Fittings.	
Sugg & Co. (accepted)	120 0 0

LONDON.—For rebuilding five houses and shops, Cross-street, Islington, for Dr. Waite. Mr. C. Freeman Murray, architect. Quantities by Mr. C. Dannell:—

Bradford	£1,737 0 0
Canning & Mullins	1,645 0 0
W. & F. Croaker	1,587 0 0
Spencer & Co.*	1,570 0 0

* Accepted, the amount being reduced to 1,250*l.*

LONDON.—For the erection of a warehouse in Theobald's-road, W.C., for Messrs. A. & H. Rowley. Messrs. Isaacs & Florence, architects:—

H. T. Williams	£1,576 0 0
B. Wire	1,556 0 0
Jackson & Todd	1,349 0 0
J. A. Taylor	1,349 0 0
Wilkinson Brothers	1,316 0 0
J. Wells & Son (accepted)	1,287 0 0

MANCHESTER.—For house for Mr. J. T. Doyle at Kersal, Manchester. Messrs. E. & F. Hewitt, architects, 9, Albert-square, Manchester:—

Robert Neill & Sons	£1,230 0 0
Edward Wood	1,130 0 0
Wm. Brown & Son	1,117 0 0
Wm. Southern & Sons (accepted)	1,115 0 0
Wm. Shaw	1,100 0 0

PLUMSTEAD.—For erecting premises for the Royal Arsenal Co-operative Society. Mr. J. O. Cook, architect:—

Proctor	£2,995 0 0
Bishop Bros.	2,850 0 0
Combs	2,846 0 0
Turtle	2,732 0 0
F. Johnson	2,695 0 0
Sharpe	2,660 0 0
R. G. Battley, Old Kent-road*	2,634 0 0

* Accepted.

PUTNEY.—For Portland stonework to the elevation of White Lion Hotel, Putney Bridge, for Mr. W. G. Silcock. Mr. Geo. Treacher, architect, 23, Carter-lane:—

Herridge (accepted)	£475 0 0

ROEHAMPTON.—For new drains, manholes, plumbers' work, ventilation, and other improvements, alterations, and additions to Tregew, Roehampton Park, for Miss Grant Suttie. Mr. Charles Edward Gritton, A.M.Inst.C.E., architect, London:—

R. Aviss & Co., Putney Bridge (accepted)	£126 0 0

ROMFORD.—For new Wesleyan chapel at Romford. Mr. Charles Bell, architect. Quantities by Messrs. Northcroft, Son, & Neighbour:—

Staines & Son	£3,344 0 0
Hoskings	3,324 0 0
Higgs & Hill	3,200 0 0
Harris & Wardrop	3,079 0 0
Hammond	3,030 0 0
Green & Lee	3,020 0 0
G. Sharpe	2,813 0 0
J. Allen & Sons (accepted)	2,750 0 0

STEPNEY.—For making sundry alterations and additions at The Star (formerly the York) beerhouse, Commercial-road, E., for Mr. H. W. Baxter. Mr. James F. Wesley, architect, 277, Romford-road, Forest Gate:—

Heiser	£630 0 0
Salt	557 0 0
Lusk	547 0 0
Harris & Wardrop	540 0 0
Trent Bros.	539 0 0
Marchant	533 10 0
J. H. Johnson	523 0 0
Hearle & Son	493 0 0
John Walker (accepted)	464 0 0

STOKE NEWINGTON.—For additions to the Presbyterian Church, Stoke Newington. Messrs. Potts, Sulman, & Hennings, architects. Quantities by Mr. G. Fleetwood:—

Roberts	£1,545 0 0
Colwell	1,526 0 0
Grover & Sons	1,520 0 0
Chessum	1,490 0 0
Scrivener	1,480 0 0
Nordan	1,445 0 0
Mattock Bros.	1,373 0 0
Oliver	1,354 0 0
Dabbs	1,347 0 0
Harris & Wardrop	1,338 0 0
J. Allen & Sons (accepted)	1,293 0 0

STREATHAM.—For stabling at Streatham, for Sir A Kirby. Mr. W. T. Hollands, architect, 27, Chancery-lane:—

Ling, Deptford	£1,590 0 0
Redman	1,400 0 0
Holloway	1,350 0 0
Mason, Streatham	1,293 0 0
Deacon, Lower Norwood and Hayward's Heath	1,275 0 0

TULSE HILL.—For repairs and decorations at Nottingham Cottage, 122, Upper Tulse Hill, for Mr. G. Dormer. Mr. Edward Crosse, architect, 32, Bermondsey-square:—

S. Kipps, Borough	£100 9 6
F. & H. F. Higgs, Loughboro' Junction	81 0 0
Peacock Bros., Tulse Hill (accepted)	69 0 0

TUNBRIDGE WELLS.—For building a cottage residence at Hadlow Down, near Tunbridge Wells, for Mrs. F. Huggins. Mr. T. Gordon, architect, 3, Courtfield-gardens, S.W. Quantities supplied by Mr. J. Rookwood, 33, Argyll-street, W.:—

Moon, Rotherfield (accepted)	£1,247 0 0

WHETSTONE—For erecting a Congregational school chapel at Oakleigh Park, Whetstone. Mr. Geo. Baines, 4, Great Winchester-street, E.C., architect:—

Pryor	£2,972 0 0
Jerrard	2,934 0 0
H. L. Holloway	2,850 0 0
Harris & Wardrop	2,738 0 0
H. & H. F. Higgs	2,735 0 0
Staines & Son	2,684 0 0
Lawrence & Sons	2,672 0 0
Neave & Neave	2,635 0 0
Holliday & Greenwood	2,590 0 0
Grover & Son	2,573 0 0
W. Johnson	2,550 0 0
J. Gregory & Co.	2,487 0 0
G. Dobson	2,475 0 0
S. J. Scott	2,469 0 0
R. G. Battley, Old Kent-road*	2,372 0 0

* Accepted, with modifications.

WILLESDEN.—For repairs, painting, &c., to the chapels at Paddington Cemetery, Willesden. Mr. R. Gadsden, surveyor:—

Plumber, Harrow-road	£109 0 0
Davey & Co., Paddington	78 0 0
O'Neil, Paddington	65 0 0
John Butland, Paddington	59 16 4
Siggers, Maida Vale	59 0 0

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TO CORRESPONDENTS.

Registered Telegraphic Address, "THE BUILDER, LONDON."

W. P. B. (we fail to see the point of your letter).—C. & C.—F. & G.—E. P. L. B.—F. E. T., Buenos Ayres (not suitable for our illustration pages).—G. W. G.—W. & B.—R. B. (we cannot continue the correspondence. You have misread the statement about "replacing decayed bricks"; replacing means taking them out and inserting good ones in their places).—A. W. R. S. (below our mark).—E. M. B. (too late).—F. J. B. (too late).

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(Ground or Lump),
For prices, &c., address S. & J. STAPLE, Quarry Owners, Stone and Lime Merchants, Stoke-under-Ham, Ilminster. [ADVT.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 38, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds, and milk-rooms, granaries, tun-rooms, and terraces. [ADVT.

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